NASA SP-7011 (125)



# AEROSPACE MEDICINE AND BIOLOGY

## A CONTINUING BIBLIOGRAPHY

## WITH INDEXES

## (Supplement 125)

## FEBRUARY 1974

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

## ACCESSION NUMBER RANGES

Accession numbers cited in this Supplement fall within the following ranges:

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NASA SP-7011 (125)

# AEROSPACE MEDICINE AND BIOLOGY

## A CONTINUING BIBLIOGRAPHY WITH INDEXES

## (Supplement 125)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in January 1974 in

- *Scientific and Technical Aerospace Reports (STAR)*
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# INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists 323 reports, articles and other documents announced during January 1974 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964; since that time, monthly supplements have been issued.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged in two major sections: *IAA Entries* and *STAR Entries*, in that order. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the slight variation in citation appearances.

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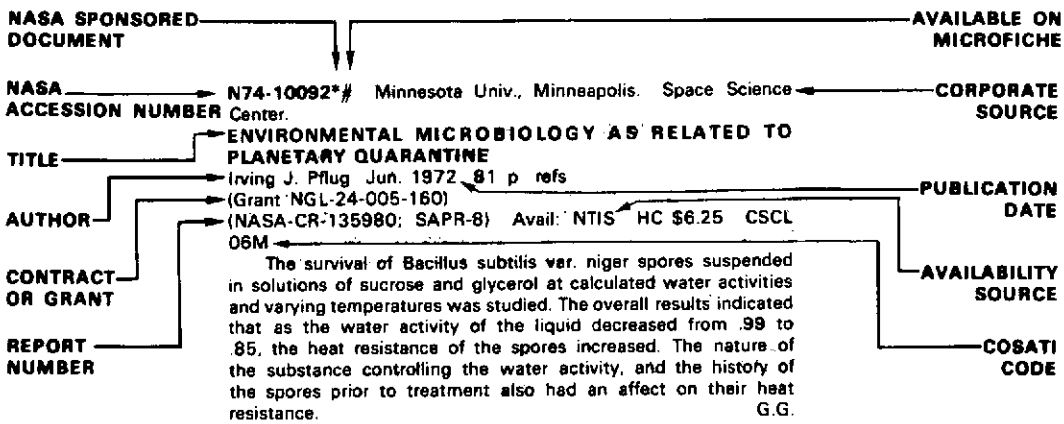


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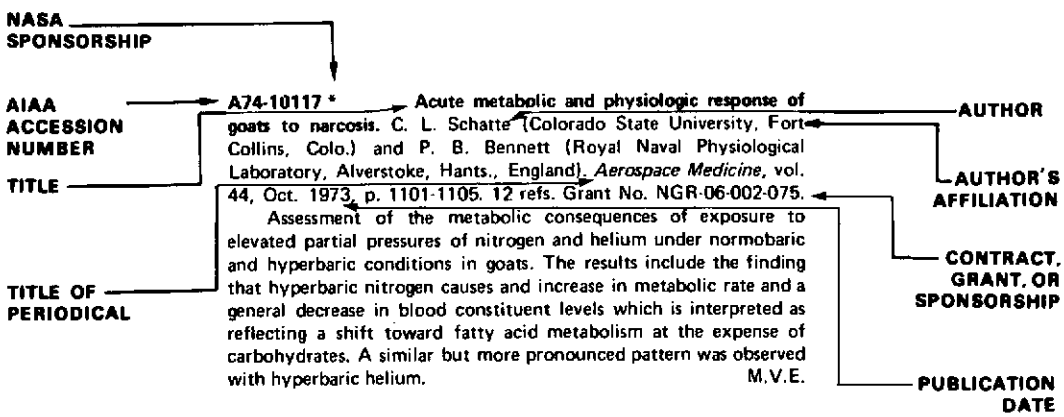

# AEROSPACE MEDICINE AND BIOLOGY

*A Continuing Bibliography (Suppl. 125)* FEBRUARY 1974


## IAA ENTRIES

**A74-10023** **Effects of random and nonrandom dotted visual noise on discrimination of a dotted target line.** J. O. Chinnis, Jr. and W. R. Uttal (Michigan, University, Ann Arbor, Mich.). *Journal of Experimental Psychology*, vol. 100, Oct. 1973, p. 335-340. 6 refs. NSF Grant No. GB-25431.

The use of a dotted-stimulus masking paradigm in research on visual pattern recognition permits the study of the interaction of mask and target in an exceptionally simple situation. The present experiment examined this interaction while varying the strength of a constraint on the placement of noise dots that produced noise-dot patterns possessing some of the elementary characteristics of figures. The results indicate that target discrimination improves regularly as the strength of the constraint increases. Implications for theories of pattern recognition are discussed. (Author)

**A74-10046** **Effects of altered preload on left ventricular systolic time intervals in acute myocardial infarction.** P. K. Khanna, P. M. Shah, D. H. Kramer, R. A. Schaefer, and I. Tager (Rochester, University, Rochester, N.Y.). *British Heart Journal*, vol. 35, Nov. 1973, p. 1102-1108. 23 refs. Research supported by the University of Rochester.

**A74-10068** # **Investigation of dynamic properties of isolated skeleton muscles.** K. Kedzior. *Archiwum Budowy Maszyn*, vol. 20, no. 2, 1973, p. 219-238. 12 refs.

Description of theoretical and experimental studies aimed at developing an improved generalized dynamic model of an isolated skeletal muscle. The main theoretical assumption employed involves treatment of the isolated muscle as a nonlinear automatic control plant with two inputs and one output. The length of the muscle and the exciting potential constitute the input parameters, while the force developed by the muscle is the output parameter. The approach used to determine the detailed structure of the model is based on the use of plant identification methods developed in automatic control theory and adapted to biological problems. Experimental studies were performed with the gastrocnemius muscle of the frog. The experimental results were employed in deriving nonlinear differential equations with coefficients that vary as a function of the length of the muscle. These equations describe the new dynamic model of the isolated muscle. T.M.

**A74-10116** **Maintenance of physical training effects by intermittent exposure to hypoxia.** R. Bason, E. L. Fox, C. E. Billings, J. E. Klinzing, K. E. Ragg, and E. C. Chaloupka (Ohio State University, Columbus, Ohio). *Aerospace Medicine*, vol. 44, Oct. 1973, p. 1097-1100. 24 refs. Research supported by the Central Ohio Heart Association.

Seven male college students, whose ages ranged from 18 to 24 years, were subjected to 8 weeks of interval training followed by 12 weeks of inactivity and intermittent exposure to 4,572 m. The data presented indicate that intermittent exposure to hypoxia may act in some degree as an antithesis to deconditioning. This is evidenced by the ability of hypoxia to maintain a lower pulmonary ventilation, lactic acid production, and heart rate during submaximal work following training. While the data are not conclusive they do lend some support to the use of hypoxia as an antideconditioning agent. If this is the case, one might suggest a wider application for the use of hypoxia. (Author)

**A74-10117** * **Acute metabolic and physiologic response of goats to narcosis.** C. L. Schatte (Colorado State University, Fort Collins, Colo.) and P. B. Bennett (Royal Naval Physiological Laboratory, Alverstoke, Hants., England). *Aerospace Medicine*, vol. 44, Oct. 1973, p. 1101-1105. 12 refs. Grant No. NGR-06-002-075.

Assessment of the metabolic consequences of exposure to elevated partial pressures of nitrogen and helium under normobaric and hyperbaric conditions in goats. The results include the finding that hyperbaric nitrogen causes and increase in metabolic rate and a general decrease in blood constituent levels which is interpreted as reflecting a shift toward fatty acid metabolism at the expense of carbohydrates. A similar but more pronounced pattern was observed with hyperbaric helium. M.V.E.

**A74-10118** **Hearing under respiratory stress - Latency changes of the human auditory evoked response during hyperventilation, hypoxia, asphyxia, and hypercapnia.** L. Deecke, R. C. Goode, G. Whitehead, W. H. Johnson, and D. P. Bryce (Toronto, University, Toronto, Canada). *Aerospace Medicine*, vol. 44, Oct. 1973, p. 1106-1111. 20 refs. Defence Research Board of Canada Grant No. 931-126.

**A74-10119** # **Effects of a hyperoxic environment on erythropoietin production.** S. R. Jaskunas, E. J. Stork, and B. Richardson (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine*, vol. 44, Oct. 1973, p. 1112-1116. 28 refs.

Experiments were performed to clarify the mechanisms by which hyperoxia suppresses erythropoiesis. Increased plasma erythropoietin levels induced in rats by phlebotomy or phenylhydrazine were suppressed by a hyperoxic environment. The stimulation of erythropoiesis by testosterone propionate, presumably resulting from increased production of erythropoietin, was also suppressed by hyperoxia. No effect on the activity of erythropoietin was found. The results suggest that decreased levels of circulating erythropoietin can be attributed to decreased production rather than increased clearance or reduction in the activity of erythropoietin. (Author)

**A74-10120** **Tetany disposition as a risk factor in pilots.** H. Oberholz (Bundesministerium der Verteidigung, Luftwaffe, Flugmedizinisches Institut, Fürstenfeldbruck, West Germany) and F.

Manz (District Hospital, Lemgo, West Germany). *Aerospace Medicine*, vol. 44, Oct. 1973, p. 1117-1119. 20 refs.

Tetanic syndrome represents a neurovegetative and neuromuscular hyperexcitation of diverse etiology. Clinical manifestations of tetany range from the characteristic tetanic episode with carpopedal spasms and acroparaesthesias as well as vegetative (cardiovascular, respiratory, gastrointestinal) to vestibular (vertigo), cerebral and psychic (depression) symptoms which may jeopardize flying safety to a high degree. Clinical and neurophysiological diagnostic possibilities to assess the tetanic disposition in the interval without clinical symptoms are presented including the following: Chvostek's sign, Trousseau's and Von Bonsdorff's signs and hyperventilation test, conventional electrical investigation (Erb's sign), and electromyography. Electrodiagnosis and electromyography are the most reliable methods of examination to demonstrate a disposition to tetany. Standardized examination of neuromuscular hyperirritability is reported. (Author)

**A74-10121 Study of fluid balance in civil aircrew.** R. M. Barnes (Air Corporations Joint Medical Service, London, England). *Aerospace Medicine*, vol. 44, Oct. 1973, p. 1130-1135. 9 refs.

In these preliminary investigations there was no evidence of systemic dehydration as opposed to local dehydration of areas like the lining of the upper respiratory tract and conjunctivae as a result of exposure to the cockpit environment. A diuresis occurring after a flight is a constant phenomena. Its cause is not established though it is almost certainly associated with the cockpit environment. Theoretically it could be caused by over-stimulation of ADH production consequent on loss of fluid from the mucous membranes of the pharynx and the conjunctivae, but no experimental proof of this was attempted. Whilst it is not considered that this phenomena is likely to be harmful, it may well contribute to bodily fatigue in aircrew. (Author)

**A74-10122 * View of human problems to be addressed for long-duration space flights.** C. A. Berry (NASA, Washington, D.C.). *Aerospace Medicine*, vol. 44, Oct. 1973, p. 1136-1146. 12 refs.

Review of the principal physiological changes seen in space flight, and discussion of various countermeasures which may prove to be useful in combating these changes in long-term space flight. A number of transient changes seen in Apollo astronauts following space flights are discussed, including cardiovascular and hemodynamic responses to weightlessness, musculoskeletal changes, changes in fluid and electrolyte balance, microbiological changes, and vestibular effects. A number of countermeasures to the effects of space flight on man are cited, including exercise, medication, diet, lower-body negative pressure, gradient positive pressure, venous occlusion cuffs, and others. A detailed review is then made of a number of psychological factors bearing on the ability of the human organism to withstand the rigors of long space flights. A.B.K.

**A74-10123 # Human exposure to high radiant environments.** J. H. Veghte (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). *Aerospace Medicine*, vol. 44, Oct. 1973, p. 1147-1151.

Assessment of the physiologic protection afforded by prototype Air Force proximity fire fighters' clothing compared to existing standard Air Force protective clothing. Based on the physiological data collected in experiments with eight subjects exposed to intense radiant sources in both laboratory and field environments, recommendations for improving clothing design to be incorporated into new prototype garments are presented. M.V.E.

**A74-10124 * Response of human red blood cell /RBC/ density distribution, RBC glutathione, and RBC enzymes to hypobaric hyperoxia.** E. C. Larkin, E. B. Smith, W. T. Williams, and F. Ulvedal (Texas, University, Galveston; USAF, School of Aerospace Medicine, San Antonio, Tex.). *Aerospace Medicine*, vol. 44, Oct. 1973, p. 1158-1163. 38 refs. NASA-supported research. NASA Order T-74401-G.

**A74-10125 Determination of parachute ripcord pull forces during free-fall - Physiological studies of military parachutists via FM/FM telemetry. IV.** D. H. Reid, J. E. Doerr, and J. A. Buckman (U.S. Navy, Naval Aerospace Recovery Facility, El Centro, Calif.). *Aerospace Medicine*, vol. 44, Oct. 1973, p. 1164-1168. 6 refs. Navy-supported research.

**A74-10126 Precipitation of cardiac arrhythmias in the mid-systolic click/late-systolic murmur syndrome by in-flight +Gz maneuvers.** D. D. Brown, D. R. Stoop, and K. C. Stanton (U.S. Naval Aerospace Medical Center, Aerospace Medical Institute, Pensacola, Fla.). *Aerospace Medicine*, vol. 44, Oct. 1973, p. 1169-1172. 14 refs. Navy-supported research.

Two young men are presented who demonstrated significant and disturbing ventricular arrhythmias in association with the mid-systolic click/late-systolic murmur syndrome. In both cases, the arrhythmias were most prominently displayed during in-flight maneuvers involving high +Gz stress. Based on our experience with these two individuals, it is recommended that individuals with this auscultatory syndrome be evaluated for arrhythmias not only with ECG monitoring post-exercise but also during and after Valsalva maneuver performed in the standing position. In addition, when aviation personnel are involved, monitoring during high +Gz conditions should be considered if there has been any suggestion of arrhythmias by history or from the previously mentioned maneuvers. (Author)

**A74-10127 Airline pilot's views on medical licensing standards.** R. L. Dodds (Air Canada, Montreal, Canada). *Aerospace Medicine*, vol. 44, Oct. 1973, p. 1183-1185.

In this paper an attempt is made to put forth a consumer's view of medical licensing standards for pilots. Some aspects of the International Civil Aviation Organization standard are considered directly, the use of drugs for hypertension therapy being one. The rationale behind medical standards is reviewed outlining the strength and weakness of some aspects thereof. An attempt is made to reflect the operational pilot's view of certain facets of medical standards relative to flight safety. Comment is made on 'flexibility' and some diagnostic procedures. The paper concludes with a few words of appreciation for the efforts being made by many practitioners of aeromedicine on behalf of pilots. (Author)

**A74-10273 Effects of various solutes on platelets exposed to hypertonic stress.** R. A. Kahn and H. T. Meryman (American National Red Cross, Bethesda, Md.). *American Journal of Physiology*, vol. 225, Oct. 1973, p. 770-775. 13 refs. Contract No. PHS-PH-463-64-102.

The minimum critical volume of human blood platelets at 37 C with NaCl as the hypertonic solute is 35% of their isotonic volume and is achieved at between 4 and 5 times isotonicity. At -5 C supercooled platelets do not reach this volume and do not show evidence of functional injury until about 8 times isotonicity. The failure of platelets at -5 C to shrink cannot be attributed to solute influx but is most likely the result of a mechanical resistance to shrinkage of unknown origin. When compounds that are macromolecular stabilizers are either substituted for NaCl or added to the hypertonic suspension, platelets are able to tolerate greater osmotic stress. M.V.E.

**A74-10274 Enzymatic regulation of electrolyte balance in rats exposed to varying levels of acute hypoxia.** T. Purshottam and N. C. Ghosh (Calcutta, University, Calcutta, India). *American Journal of Physiology*, vol. 225, Oct. 1973, p. 801-804. 33 refs.

Research supported by the Council of Medical Research of India.

Activities of the enzymes Na(+)-K(+)-activated Mg(+2)-dependent ATPase, which is responsible for the active transport of Na(+) and K(+) ions across cell membranes, and carbonic anhydrase, which greatly affects movement of penetrating ions across membrane barriers, are reported. The experimentally investigated overall effect of these enzymes on the distribution of ions in different tissues of rats at varying levels of acute hypoxia is discussed. M.V.E.

**A74-10321 *** **Performance of cellulose acetate butyrate membranes in hyperfiltration of sodium chloride and urea feed solution.** T. Wydeven and M. Leban (NASA, Ames Research Center, Moffett Field, Calif.). *Journal of Applied Polymer Science*, vol. 17, 1973, p. 2277-2287. 13 refs.

Cellulose acetate butyrate (CAB) membranes are shown to give high salt and urea rejection with water flux of about 3 gallons/sq ft per day at 600 psig. Membranes prepared from a formulation containing glyoxal show a significant increase in flux and decrease in salt and urea rejection with drying time. Zero drying time gives maximum urea and salt rejection and is therefore most suitable for hyperfiltration of sodium chloride and urea feed solution. M.V.E.

**A74-10341 #** **Mechanisms of hyperlipidemia and early atherosclerosis development in airmen (O mekhanizme vozniknoveniia giperlipidemii i rannego ateroskleroza u letchikov).** A. A. Novitskii and N. F. Markizova. *Voenno-Meditsinskii Zhurnal*, Aug. 1973, p. 27-31. In Russian.

A group of airmen 45 years old or younger, flying on helicopters, turboprops and jets, was subjected to medical examinations over a two- to three-week off-duty period in an attempt to determine the effects of their professional stresses on lipid metabolism. Studies of the functional state of their hypophysis and adrenal cortex showed no detectable symptoms of atherosclerosis. Hyperlipidemia was diagnosed in the subjects even below 30 years of age. V.Z.

**A74-10342 #** **Physiological reactions during motion sickness (Fiziologicheskie reaktsii pri ukachivanii).** V. V. Usachev. *Voenno-Meditsinskii Zhurnal*, Aug. 1973, p. 56-61. 11 refs. In Russian.

Arterial pressure oscillograms, EKGs, pneumograms and rheoencephalograms were recorded in three groups of 200 civil aviation pilots and flying school aspirants who were subjected to multiply repeated Coriolis forces in combination with small angular and centripetal accelerations in a study of the physiological effects of the motion sickness. A close relation was established between disorders in the respiratory and cardiovascular systems and the acceleration tolerance levels of the subjects. V.Z.

**A74-10394 #** **A method of determining the polydispersity and concentration of erythrocytes in whole blood and thrombocytes in thrombocytic mass (Sposob opredeleniia polidispersnosti i kontsentratsii eritrotsitov v tsel'noi krovi i trombotsitov v trombotsitarnoi masse).** A. Ia. Khairullina and S. F. Shumilina. *Zhurnal Prikladnoi Spektroskopii*, vol. 19, Sept. 1973, p. 538-544. 9 refs. In Russian.

**A74-10436 * #** **Functions of a new photoreceptor membrane.** D. Oesterhelt (München, Universität, Munich, West Germany) and W. Stoeckenius (California, University, San Francisco, Calif.). *National Academy of Sciences, Proceedings*, vol. 70, Oct. 1973, p. 2853-2857. 21 refs. Research supported by the Deutsche Forschungsgemeinschaft; Grants No. NIH-HL-06285; No. NGL-05-025-014.

In the investigation of light responses on halobacteria phototaxis; ATP synthesis; and changes in O2 consumption, purple membrane biosynthesis, and proton translocation were found. The last three effects are discussed, which suggest that the purple membrane may function as an energy-coupling membrane for light. It is also suggested that purple membrane, through cyclic light-induced conformational changes of its bacteriorhodopsin, directly converts absorbed light energy into a proton gradient and presumably also an electric potential difference across the membrane analogous to observations in other prokaryotic cells, mitochondria, and chloroplasts. F.R.L.

**A74-10437** **Flights at high altitude and radiobiology. I, II (Vols à haute altitude et radiobiologie. I, II).** R. P. Delahaye (Hôpital d'Instruction des Armées Bégin, Saint-Mandé, Val-de-Marne, France) and P. Sturrock (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). *Médecine et Armées*, vol. 1, Sept.-Oct. 1973, p. 19-29. 39 refs. In French.

Work undertaken under the direction of the Concorde aeromedical group makes possible a better understanding of different types of radiations of certain fundamental phenomena, i.e., cosmic rays and solar flares. All Concorde aircraft possess on-board apparatus which can simultaneously measure the instantaneous and the cumulative radiation dosage. Various dosimeters are briefly described. The risks of radiocarcinogenesis and risks to embryo development are discussed, as well as the effect of radiation on longevity. It is concluded that the dangers created by exposure to radiations between 15 and 20 km altitude are actually quite small, partly due to the short exposure time. F.R.L.

**A74-10488** **International Symposium on Dynamics and Control in Physiological Systems, Rochester, N.Y., August 22-24, 1973, Selected Papers.** Symposium sponsored by the International Federation of Automatic Control. *ASME, Transactions, Series G - Journal of Dynamic Systems, Measurement, and Control*, vol. 95, Sept. 1973. 104 p.

Aspects of physiological pharmacokinetics are considered together with a model of human salt and water regulation, the principle of specific coding, blood flow and oxygen uptake during exercise, and a qualitative model of the calcium and phosphate metabolism. Other subjects explored include the dynamics of exercise hyperemia, nonlinear metabolic dynamics of the pancreas and liver, and a computer model of cardiovascular control system responses for exercise. Questions of the simulation of respiratory regulation of blood gases in the critically ill patient are explored along with aspects of instability and mitotic patterns in tissue growth, the adaptive control of respiratory mechanics, and the digital simulation of the chemical control of ventilation. G.R.

**A74-10489 * #** **Blood flow and oxygen uptake during exercise.** J. W. Mitchell (Wisconsin, University, Madison, Wis.), J. A. J. Stolwijk, and E. R. Nadel (Yale University, New Haven, Conn.). *(International Federation of Automatic Control, International Symposium on Dynamics and Control in Physiological Systems, Rochester, N.Y., Aug. 22-24, 1973.) ASME, Transactions, Series G - Journal of Dynamic Systems, Measurement, and Control*, vol. 95, Sept. 1973, p. 274-278. 23 refs. Contract No. NAS9-9531.

A model is developed for predicting oxygen uptake, muscle blood flow, and blood chemistry changes under exercise conditions. In this model, the working muscle mass system is analyzed. The conservation of matter principle is applied to the oxygen in a unit mass of working muscle under transient exercise conditions. This principle is used to relate the inflow of oxygen carried with the blood to the outflow carried with blood, the rate of change of oxygen stored in the muscle myoglobin, and the uptake by the muscle. Standard blood chemistry relations are incorporated to evaluate venous levels of oxygen, pH, and carbon dioxide. G.R.

**A74-10490 #** **Dynamics of exercise hyperemia.** D. E. Mohrman and H. V. Sparks (Michigan, University, Ann Arbor, Mich.). *(International Federation of Automatic Control, International Symposium on Dynamics and Control in Physiological*

*Systems, Rochester, N. Y., Aug. 22-24, 1973.) ASME, Transactions, Series G - Journal of Dynamic Systems, Measurement, and Control,* vol. 95, Sept. 1973, p. 285-290. 31 refs. Research supported by the University of Michigan; Grant No. PHS-HL-14516.

Description of a model of skeletal muscle metabolism and local control of vascular resistance. The model predicts changes in tissue O2 partial pressure and interstitial K(+) concentration associated with muscle activity and the effects of these alterations on vascular resistance. Predictions based on the model match the experimentally determined responses of venous O2 saturation, venous K(+) concentration, and vascular resistance to brief tetanus at both high and low constant flow. Model simulations of brief tetanus indicate that the resistance response at high flow is caused almost entirely by changes in interstitial K(+), whereas the vascular response observed at low flow has a fast component due to K(+) and a slow component caused by low tissue O2 partial pressure. This study supports the hypothesis that local vascular control involves more than one substance, but that the relative importance of each influence on vascular resistance depends upon the experimental conditions. (Author)

**A74-10491 * #** **Computer model of cardiovascular control system responses to exercise.** R. C. Croston (General Electric Co., Space Div., Houston, Tex.), J. A. Rummel (NASA, Johnson Space Center, Environmental Physiology Branch, Houston, Tex.), and F. J. Kay (Houston, University, Houston, Tex.). *(International Federation of Automatic Control, International Symposium on Dynamics and Control in Physiological Systems, Rochester, N.Y., Aug. 22-24, 1973.) ASME, Transactions, Series G - Journal of Dynamic Systems, Measurement, and Control,* vol. 95, Sept. 1973, p. 301-307. 14 refs.

Approaches of systems analysis and mathematical modeling together with computer simulation techniques are applied to the cardiovascular system in order to simulate dynamic responses of the system to a range of exercise work loads. A block diagram of the circulatory model is presented, taking into account arterial segments, venous segments, arterio-venous circulation branches, and the heart. A cardiovascular control system model is also discussed together with model test results. G.R.

**A74-10492 #** **Thermal control in man - Regulation of central temperature or adjustments of heat exchanges by servomechanism.** Y. Houdas, A. Sauvage, M. Bonaventure, C. Ledru, and J.-D. Guieu (Lille II, Université, Lille, France). *(International Federation of Automatic Control, International Symposium on Dynamics and Control in Physiological Systems, Rochester, N.Y., Aug. 22-24, 1973.) ASME, Transactions, Series G - Journal of Dynamic Systems, Measurement, and Control,* vol. 95, Sept. 1973, p. 331-335. 24 refs.

A model of the thermoregulatory mechanisms of the human subject submitted to a heat load is presented. It is based on the hypothesis that the thermoregulatory system controls mainly the level of body heat storage but not directly the deep body temperature. The thermoregulatory system would thus appear to be a servomechanism for the heat exchanges rather than a regulator of central temperature. (Author)

**A74-10493 #** **Multi-sensor human spatial orientation and postural control system.** L. R. Young (MIT, Cambridge, Mass.; Kantonsspital, Zurich, Switzerland). *(International Federation of Automatic Control, International Symposium on Dynamics and Control in Physiological Systems, Rochester, N.Y., Aug. 22-24, 1973.) ASME, Transactions, Series G - Journal of Dynamic Systems, Measurement, and Control,* vol. 95, Sept. 1973, p. 343, 344. 7 refs.

A presumed dynamic ordering of the multiple sensors in posture maintenance and spatial orientation includes vision, otoliths, semicircular canals, proprioceptors, and exteroceptors. The visual system is considered together with the vestibular system and the significance of exteroceptive tactile information. The degree to which the sensory information is mixed has been a subject of intense study. The mixing of sensory signals and the process of sorting out information of a contradictory nature is most likely influenced by the prediction of an 'expected' pattern of sensory responses. G.R.

**A74-10501 #** **Evaluation of ventriculo-atrial conduction in a randomly induced ventricular rhythm (Evaluation de la conduction ventriculo-auriculaire dans un rythme ventriculaire induit au hasard).** N. El-Sherif, Y. Saad, and Z. El-Ramily (Cairo, University, Cairo, Egypt). *Acta Cardiologica,* vol. 28, no. 4, 1973, p. 379-391. 25 refs. In French.

Estimation of the frequency of ventriculo-atrial conduction in a ventricular rhythm group randomly induced by catheterization of the right ventricle. In a study of 38 subjects, including eight with various retrograde conduction disorders, the retrograde conduction frequency was found to be significantly higher in subjects with normal atrio-ventricular conduction than in those with impaired conduction. In the first group, ventriculo-atrial conduction was particularly dependent on the duration of the P-R interval. The functional relation between anterograde and retrograde conduction was studied, as well as the difference in frequency between spontaneously or randomly induced ventricular rhythm and selectively induced rhythm. Ventriculo-atrial conduction was found to depend on the frequency of the ectopic rhythm and on the temporal relation between this rhythm and the sinus rhythm, as well as on the quality of anterograde conduction. A.B.K.

**A74-10502 #** **Technical progress in phonocardiography and pulse tracings.** A. A. Luisada (Oak Forest Hospital, Chicago, Ill.) and L. P. Feigen (University of Health Sciences, Chicago, Ill.). *Acta Cardiologica,* vol. 28, no. 4, 1973, p. 392-414. 12 refs.

Description of several methods and devices designed to simplify, improve, or make more practical the recording of phonocardiograms, apex cardiograms, and pulse tracings. The topics discussed include a method of obtaining simultaneous tracings from a single microphone with different filters, a method of obtaining tracings with sharp filtration even when the equipment has filters with a low slope, a method of obtaining simultaneous tracings from three different microphones with identical filters, the use of the phonoscan or total phonocardiogram, various methods and devices for minimizing the noise caused by respiration, a method of recording the third derivative of the displacement tracing, a description of a lightweight portable phonocardiograph, the recording of a vector-phonocardiogram from two areas of the chest, the recording of two simultaneous high-resolution phonocardiograms, and a method of recording the brachial or tibial pulse. A.B.K.

**A74-10751 Limiting factors of physical performance; Proceedings of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971.** Symposium sponsored by the MAIZENA Gesellschaft. Edited by J. Keul (Medizinische Universitätsklinik, Freiburg im Breisgau, West Germany). Stuttgart, Georg Thieme Verlag, 1973. 291 p. $16.25.

The papers are grouped under the headings of contractile apparatus, enzymatic organization and energy production, substrate and oxygen supply (microcirculation), and circulation and respiration. Among numerous subjects treated in detail are the neuromuscular characteristics of athletes, exercise induced enzymatic adaptations in muscle, glycogenolysis and lipolysis, oxygen supply as a limiting factor in physical performance, limiting factors of anaerobic performance in man, and liver glycogen as a glucose-supplying source. Among other subjects, the influence of hypoxia and hyperoxia training on the cardiopulmonal capacity, myocardial contractility during exercise, and muscle blood flow during exercise are discussed.

F.R.L.

**A74-10752 Neuromuscular characteristics of athletes.** A. Partheniu (Institutul de Educatie Fizica si Sport, Bucharest,

Rumania). In: Limiting factors of physical performance; Proceedings of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971. Stuttgart, Georg Thieme Verlag, 1973, p. 12-22. 40 refs.

Four cardinal indicators are considered: neuromuscular irritability of the muscle explored at the motor point; electromyograms; mechanical activity recorded under basal conditions (minimal or quasi-minimal twitches); and myotatic reflexes. Well-trained athletes of both sexes present the following neuromuscular physiological characteristics: (1) the functional coherence between the phasic, tonic, and intermediate fibers is maintained, (2) the innervation is more economical and better 'organized,' (3) the specific effort is well-tolerated and the modifications of the cardinal physiological indicators are reduced, homogeneous, and rapidly compensated, and (4) the physico-tonic level and profile of the excitability at the motor point present certain modifications of a permanent character. F.R.L.

**A74-10753** **Differences between red and white muscles.** D. Pette and H.-W. Staudte (Konstanz, Universität, Konstanz, West Germany). In: Limiting factors of physical performance; Proceedings of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971. Stuttgart, Georg Thieme Verlag, 1973, p. 23-35. 115 refs.

Supplying energy is the primary task of muscular metabolism. Metabolic differentiation of various muscles may therefore be understood as the expression of an optimum adjustment of the type of energy supply to the conditions of energy expenditure. The most obvious difference between red and white muscle types is due to the different myoglobin content. Red muscles show high myoglobin levels and correspondingly high metabolic capacities for aerobic substrate oxidation. White muscles have low myoglobin content and are characterized by relatively low metabolic capacities for aerobic substrate oxidation. F.R.L.

**A74-10754** **Differences in development of fatigue in slow and fast muscles.** O. Hudlicka (Birmingham, University, Birmingham, England). In: Limiting factors of physical performance; Proceedings of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971. Stuttgart, Georg Thieme Verlag, 1973, p. 36-41. 34 refs.

Attention is given to fatigue defined as the diminution of twitch tension in isometrically contracting muscle or of external work in isotonically contracting muscle during the course of continuous contractions. Possible mechanisms considered as most likely are fatigue at the neuromuscular junction, failure of excitation-contraction coupling, and exhaustion of energy supply necessary for muscular contraction. Experiments are described which suggest that the presence of a sufficient amount of inorganic phosphate is a prerequisite for muscle performance without fatigue. F.R.L.

**A74-10755** **Efficiency and capacity of mitochondrial energy transformation.** G. Schäfer (Hannover, Technische Hochschule, Hanover, West Germany). In: Limiting factors of physical performance; Proceedings of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971.
Stuttgart, Georg Thieme Verlag, 1973, p. 41-56. 90 refs.

Details of a schematic diagram of mitochondrial structure and energy-linked activities are discussed with reference to the problem of whether mitochondrial energy transformation is an adaptable system. The efficiency of oxidative phosphorylation as an independent functional unit is essentially a problem of the tightness of energy coupling. The capacity of this system and of auxiliary systems providing the reducing equivalents, i.e., the dehydrogenases is considered. The structure and function of the membrane lipids are discussed as a parameter exerting control on the metabolic efficiency and capacity of the whole organelle. F.R.L.

**A74-10756** **The dynamics of the energy-rich phosphates.** R. E. Davies (Pennsylvania, University, Philadelphia, Pa.). In: Limiting factors of physical performance; Proceedings of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971. Stuttgart, Georg Thieme Verlag, 1973, p. 56-62. 40 refs.

The limiting of performance of muscles for maintaining constant load when no external work is being done seems to depend quite crucially on the ability of the muscle to reduce its energy metabolism while maintaining the load. This seems to be related to the ability of the muscle to slow down its rate of adenosine triphosphate (ATP) usage after it has done its work. It appears that the factors which can limit physical performance at the level of the turnover of the energy-rich phosphates is determined by the rate of reactions that form the energy-rich phosphates, the accumulation of products from the metabolism of the energy-rich phosphates, and from other biochemical processes such as lactic acid formation which occurred concomitantly, and the maximum rate of the ATPase of the actomysin of that particular muscle which seems to be the overall limiting factor for convulsive activity. F.R.L.

**A74-10757** **Mechanochemical energy coupling.** J. C. Rüegg (Rühr-Universität, Bochum, West Germany). In: Limiting factors of physical performance; Proceedings of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971.
Stuttgart, Georg Thieme Verlag, 1973, p. 63-66.

The questions of how it is that adenosine triphosphatase (ATPase) activity and power appear to be coupled, and whether muscular movement per se affects the ATPase are considered. It is shown that mechanical movement affects the rate of ATP splitting and presumably the frequency of crossbridge cycling. This means that mechanical and chemical rate processes are interdependent and coupled. The observed effect may well be the cause for the dramatic increase in ATPase activity when an isometrically held muscle is allowed to shorten and to put out mechanical power. F.R.L.

**A74-10758** **Exercise induced enzymatic adaptations in muscle.** J. O. Holloszy, P. A. Mole, K. M. Baldwin, and R. L. Terjung (Washington University, St. Louis, Mo.). In: Limiting factors of physical performance; Proceedings of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971.
Stuttgart, Georg Thieme Verlag, 1973, p. 66-80. 91 refs. Grant No. PHS-HD-01613.

Endurance exercise, such as long distance running or swimming, can result in major biochemical and physiological adaptations. These are manifested functionally as an increase in the capacity for prolonged muscular work, without an increase in strength. Work done in the laboratory to obtain information regarding the biochemical basis for this increase in functional capacity is described and discussed. It appears that when skeletal muscle adapts to endurance exercise, it becomes more like cardiac muscle in that its content of mitochondria and its capacity to generate adenosine triphosphate from oxidation of pyruvate and fatty acids increases. Since physical training of the endurance type does not affect strength, it seems reasonable to assume that the same number of muscle fibers are stimulated to contract in the trained as in the untrained state when an individual performs a given submaximal work task. F.R.L.

**A74-10759** **Factors controlling glycogenolysis and lipolysis during exercise.** P. D. Gollnick (Washington State University, Pullman, Wash.). In: Limiting factors of physical performance; Proceedings of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971. Stuttgart, Georg Thieme Verlag, 1973, p. 81-93. 31 refs. Grant No. PHS-HE-08262.

Studies were made to determine what factors are responsible for initiating and sustaining the mobilization of fats and carbohydrates during exercise. All the experiments described in which a possible

role of the sympathetic nervous system in substrate mobilization during exercise was tested were conducted with some form of blocking agents. To overcome the objections of using blocking agents, an experiment was undertaken in which the terminal nerve endings of the sympathetic nerves were destroyed with 6-hydroxydopamine. F.R.L.

**A74-10760** **Hormonal regulations in muscle training.** H. Kraus (Universität-Kinderklinik, Göttingen, West Germany) and R. Kinne (Max-Planck-Institut für Biophysik, Frankfurt am Main, West Germany). In: Limiting factors of physical performance; Proceedings of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971. Stuttgart, Georg Thieme Verlag, 1973, p. 94-102. 43 refs.

A study is described which indicated that depriving rats of thyroid hormones slowed down metabolic activity and physical performance, two conditions shown to increase in normal animals after vigorous physical training. Substitution with small amounts of thyroid hormones both restored oxidative enzyme activities and also considerably improved the working capacity of the animals. These results demonstrated that the ability of the mammalian organism to adapt for the higher energy requirements in response to endurance exercise might depend upon its thyroid function. F.R.L.

**A74-10761** **Protein synthesis in heart and skeletal muscle of rats during and subsequent to exercise.** H.-G. Zimmer and E. Gerlach (Rheinisch-Westfälische Technische Hochschule, Aachen, West Germany). In: Limiting factors of physical performance; Proceedings of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971. Stuttgart, Georg Thieme Verlag, 1973, p. 102-109. 17 refs. Deutsche Forschungsgemeinschaft Grant No. Ge-129/7,8.

**A74-10762** **Local energy-supplying substrates as limiting factors in different types of leg muscle work in normal man.** E. Hultman and J. Bergstrom (St. Eriks Sjukhus, Stockholm, Sweden). In: Limiting factors of physical performance; Proceedings of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971. Stuttgart, Georg Thieme Verlag, 1973, p. 113-125. 34 refs. Research supported by the Swedish Medical Research Council. SMRC Project B 72-19X-2647-04.

To study the metabolism of glycogen and to what extent the level can be limiting during dynamic exercise, repeated muscle biopsies were performed during work and were analyzed for glycogen, active phosphates, and glycolytic metabolites. The exercise was performed on a bicycle ergometer, and in these experiments work was continued until exhaustion. Work capacity during dynamic exercise at very low work levels does not eppear to be dependent upon the level of any one energy-producing substrate located locally in the muscle cells. At moderate to high work intensities, work capacity is quite clearly dependent on the amount of the local glycogen at rest and the efficiency with which it is utilized. Work capacity at maximal and supramaximal loads and during isometric exercise appears to be dependent upon the maintenance of an adequate supply of adenosine triphosphate, but unlike at moderate work levels this in itself is not dependent upon the absolute level of any one energy-producing substrate, but upon the relative kinetics of supply and demand as determined by a few key enzymes. F.R.L.

**A74-10763** **The oxygen diffusion path in resting and exercising skeletal muscle.** W. Grunewald (Max-Planck-Institut für Arbeitsphysiologie, Dortmund, West Germany). In: Limiting factors of physical performance; Proceedings of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971. Stuttgart, Georg Thieme Verlag, 1973, p. 128-137.

Since the skeletal muscle can change its oxygen consumption during transition from rest to extreme charge and vice versa by nearly two powers of ten, the influence of these parameters on the diffusion path is of special importance. For such a change in oxygen consumption two extremes may occur with respect to diffusion path and oxygen distribution over this distance. A defined diffusion path is always assigned to the arterial end of a capillary and to the venous end of the adjacent one. The oxygen quantity diffusing via these paths does not suffice to prevent the decrease of the minimum oxygen partial pressure in tissue below the critical mitochondrial oxygen partial pressure. The diffusion path of the arterial end of the capillary reaches toward the venous end of the adjacent capillary. Under these conditions oxygen diffuses toward the venous end and from there it is moved without being usable for the supply of the tissue. This is called oxygen diffusion shunt. For energetic reasons the tissue cannot tolerate the first mentioned supply situation for long; the second one is extremely uneconomic. F.R.L.

**A74-10764** **Critical oxygen tensions in muscle.** W. N. Stainsby (Florida, University, Gainesville, Fla.). In: Limiting factors of physical performance; Proceedings of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971. Stuttgart, Georg Thieme Verlag, 1973, p. 137-144. 5 refs.

Experimental study of the role of oxygen in maximum physical performance limitation, with special attention to oxygen in muscle, in contrast to oxygen in the whole organism, as the rate-limiting metabolite. Using in situ gastrocnemius-plantaris and semitendinosis muscles of the dog, it is shown that, with hypoxic hypoxia, oxygen can be the rate-limiting metabolite in muscle, but for conditions of normoxia with normal blood hemoglobin content and normal blood flow, oxygen probably is not the rate-limiting metabolite. M.V.E.

**A74-10765** **Oxygen supply as a limiting factor in physical performance.** L. Kaijser (Karolinska Sjukhus, Stockholm, Sweden). In: Limiting factors of physical performance; Proceedings of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971. Stuttgart, Georg Thieme Verlag, 1973, p. 145-156. 30 refs.

Since a substantial increase in arterial oxygen content is possible only by oxygen breathing at increased atmospheric pressure, physical performance was studied during oxygen breathing at three atmospheres absolute pressure (ata) in a pressure chamber and compared with corresponding performance during air breathing at one ata. The importance of oxygen supply as a limiting factor may be different when large muscle groups are active and a high demand is placed on the central circulation and when only a small muscle mass is active. Therefore, both dynamic forearm work on a hand ergometer and leg work on a cycle ergometer were studied. It appears that oxygen supply by the circulatory system is not the main limiting factor for performance in the average subject. F.R.L.

**A74-10766** **Limiting factors of anaerobic performance in man.** P. Cerretelli and G. Ambrosoli (Milano, Università, Milan, Italy). In: Limiting factors of physical performance; Proceedings of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971. Stuttgart, Georg Thieme Verlag, 1973, p. 157-165. 19 refs.

Summary of some recent contributions to the field of anaerobic metabolism, particularly in man. Attempts are made to reconcile some of the results obtained in humans with analogous findings derived from experiments on isolated muscle preparations. M.V.E.

**A74-10767** **Changes in muscle water and electrolytes during exercise.** J. Bergstrom (St. Eriks Sjukhus, Stockholm, Sweden), G. Guarnieri (Clinica Metodologica, Padua, Italy), and E. Hultman (St. Eriks Sjukhus, Stockholm; Beckomberga, Sjukhus, Sweden). In: Limiting factors of physical performance; Proceedings

of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971. Stuttgart, Georg Thieme Verlag, 1973, p. 173-178. 16 refs.

Review of a selection of recent and a few earlier published investigations of carbohydrate, water, and electrolyte metabolism in normal human subjects during exercise, with special attention to water and electrolyte shifts as possible work-limiting factors. In the heavy-exercise experiments reviewed, lactic acid accumulation and intracellular water shifts were most pronounced after five minutes of work. Still these subjects could continue working until the glycogen store was depleted, indicating that water and electrolyte shifts, secondary to lactic acid accumulation, do not limit the capacity to perform heavy intermittent exercise. At still higher intensities, as in hard isometric work, there is evidence that inhibition of glycolysis at the phosphofructokinase level is a limiting factor for the resynthesis of active phosphate and, thus, for the ability to sustain a prolonged contraction. M.V.E.

**A74-10768 Liver glycogen as a glucose-supplying source during exercise.** E. Hultman (St. Eriks Sjukhus, Stockholm; Beckomberga, Sjukhus, Sweden) and L. Nilsson (St. Eriks Sjukhus, Stockholm, Sweden). In: Limiting factors of physical performance; Proceedings of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971. Stuttgart, Georg Thieme Verlag, 1973, p. 179-189. 35 refs. Research supported by the Swedish Medical Research Council. SMRC Project B 72-19X-2647-04.

Adrenalin and noradrenalin were given to a series of subjects and the changes in liver glycogen before and during the infusions were followed. It is shown that the glucose output from the liver can contribute energy fuel for muscle during hard exercise, especially at the end of an exercise period when the muscle glycogen level is low. In strenuous exercise involving large muscle groups only 10 to 20% of the total carbohydrate utilized is derived from liver glycogen calculated over the whole work period. Gluconeogenesis in the liver is low in normal dietary conditions during heavy exercise, but can be increased when gluconeogenic enzymes are stimulated by carbohydrate starvation during more than 24 hours before the exercise, provided that the oxygen supply to the liver during the exercise is sufficient. Severe hypoglycemia during heavy exercise, especially after a carbohydrate-poor diet, has been observed to exert a limiting effect on work capacity. F.R.L.

**A74-10769 Importance of humoral changes to physical performance.** G. Haralambie (Medizinische Universitätsklinik, Freiburg im Breisgau, West Germany). In: Limiting factors of physical performance; Proceedings of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971.
Stuttgart, Georg Thieme Verlag, 1973, p. 189-200. 68 refs.

The biochemical changes in the body fluids during exercise are numerous and complex. Some of the blood components vary as a mere consequence of hemoconcentration, while the changes of most others reflect metabolic processes. Some compounds are metabolized in another organ (liver, kidney) after leaving the muscle. In other cases there are phasic changes during the exercise, reflecting the dynamic equilibrium between mobilization, breakdown, and elimination of the corresponding substances. Acid-base equilibrium, the loss of low-molecular compounds from muscle, and the loss of enzymes from muscle are discussed. F.R.L.

**A74-10770 Oxygen pressure and content in the blood during physical exercise and hypoxia.** E. Doll (Deutsche Klinik für Diagnostik, Wiesbaden, West Germany). In: Limiting factors of physical performance; Proceedings of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971.
Stuttgart, Georg Thieme Verlag, 1973, p. 201-211. 19 refs.

The question of whether physical exercise with the normal oxygen transport system (lung, blood, heart, circulation) can be limited by blood oxygen is studied. Such a limitation would primarily be expected with those organs which are especially active during physical exercise, i.e., active skeletal muscles and the myocardium. Arterial oxygen pressure, oxygen pressure in the venous blood from the active skeletal muscles and myocardium, and the reaction during exercise of arterio-muscle-venous and arterio-coronary-venous O2 difference of content were determined. Data were obtained during hypoxia to establish a limitation of efficiency due to O2. F.R.L.

**A74-10771 The influence of hypoxia and hyperoxia training in a laboratory on the cardiopulmonal capacity.** W. Hollmann and H. Liesen (Köln, Deutsche Sporthochschule, Cologne, West Germany). In: Limiting factors of physical performance; Proceedings of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971. Stuttgart, Georg Thieme Verlag, 1973, p. 212-218. 14 refs.

**A74-10772 Myocardial contractility during exercise.** H. Roskamm (Rehabilitationszentrum für Herz- und Kreislaufkranke, Krozingen, West Germany). In: Limiting factors of physical performance; Proceedings of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971.
Stuttgart, Georg Thieme Verlag, 1973, p. 225-234. 11 refs.

Contractility measurements in the left ventricle at rest and during exercise in 11 healthy men ranging in age from 19 to 27 are reported, along with repeated measurements in nine of them with beta-receptor blockade. The purpose of this investigation, namely, determining whether myocardium contractility during exercise is a limiting factor of the pumping performance of the healthy heart, remains unfulfilled. The following results seem to weaken the likelihood of such a limitation: (1) there is only a very slight reduction in pumping performance after nearly total inhibition of contractility increase during exercise following beta-receptor blockade; and (2) no increase in contractility could be found in athletes, in spite of considerably increased cardiac output during maximum exercise. M.V.E.

**A74-10773 Oxygen transport by the circulatory system during exercise in man.** B. Saltin (Gymnastik- och Idrottshogskolan, Stockholm, Sweden). In: Limiting factors of physical performance; Proceedings of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971. Stuttgart, Georg Thieme Verlag, 1973, p. 235-252. 37 refs.

Review of recent research in the field of exercise physiology with special attention to factors limiting man's capacity for physical exercise. It is shown that cardiac output per se is not the primary limiting factor in brief maximal or in prolonged exercise, but heart dimensions set an upper limit to central circulation, to arterial oxygen transportation, and to work performed for periods longer than a few minutes. M.V.E.

**A74-10774 Muscle blood flow during exercise and its significance for maximal performance.** J. P. Clausen (Frederiks Hospital, Copenhagen, Denmark). In: Limiting factors of physical performance; Proceedings of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971.
Stuttgart, Georg Thieme Verlag, 1973, p. 253-266. 44 refs.

**A74-10775 Age and performance.** J. S. Skinner (Montreal, Université, Montreal, Canada). In: Limiting factors of physical performance; Proceedings of the International Symposium, Gravenbruch, West Germany, October 1-3, 1971.
Stuttgart, Georg Thieme Verlag, 1973, p. 271-282. 48 refs.

It is shown that aging is characterized by impaired ability to adapt to and to recover from physiological stress, and that the degree of impairment is related to the structural and chemical changes occurring in the various systems of the body. Since the performance of exercise requires the response and integrated function of many

physiological regulating mechanisms, performance may be limited by either an inadequate response (adaptation) or by inadequate integration of the responses of several organ systems. In spite of the higher relative capacity for work of trained persons, the rate of aging of the cardiovascular and respiratory systems does not appear to be influenced by training or the level of activity. V.P.

**A74-10828 International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures (Internationaler Kongress für Luft- und Raumfahrtmedizin, 21st, Munich, West Germany, September 17-21, 1973, Vorabdrucke der Vorträge).** Congress sponsored by the Deutsche Gesellschaft für Luft- und Raumfahrtmedizin. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973. 368 p. In German, English, and French. $6.30.

Topics discussed include the effects of acceleration and vibration, studies in the field of space medicine, internal dissociation and desynchronization of circadian rhythms, hypoxia, causes for grounding of pilots, special problems connected with the Concorde supersonic transport, flight safety and flight accidents, trends in aeromedical research, physiological limits of diving operations, rhythms and rest-activity cycles, bionics, the vestibular organ, space biology, aeromedical aspects of accident trends, pilot trainee selection and surveillance, clinical aviation medicine, air traffic controllers, controller stress in future air traffic control systems, the cardiovascular system, effects of weightlessness and immersion, studies of the eye, the relation between the spine and flight fitness, and human engineering studies.

A.B.K.

**A74-10829 # Effect of positive +Gz acceleration on the alveolar plateau of expiratory O2 and CO2 partial pressure curves.** G. von Nieding, H. Krekeler, K. Koppenhagen, and S. Ruff (Hospital Bethanien, Moers; Berlin, Freie Universität, Berlin; Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures.
Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 5, 6. 9 refs.

**A74-10830 # Minimization methods in the development of biodynamic models.** H. E. Krause, H. L. Oestreicher, H. L. Vogt, and H. T. Mohlman (Dayton, University, Dayton; USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio; Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures.
Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 10, 11. 5 refs.

A demonstration is given of the feasibility of mathematical techniques that do not require prior knowledge of a specific model structure. In the approaches used both model structure and values for the model parameters are derived by minimizing the differences between model performance and experimental observation. It is pointed out that minimization methods are promising in biomechanical modeling. Success depends largely on the quality and number of the experimental data. G.R.

**A74-10831 # The generation of CO in spacecraft (Entstehung von CO in Raumfahrzeugen).** H. G. Clamann (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures.
Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 12, 13. In German.

In tests conducted with animals in closed space capsules a growing concentration of CO had been observed. It was found that a small dc motor was the main source of the CO. An investigation involving various small motors with power ratings in the range from 10 to 30 W was conducted to explore the conditions of CO generation. The dependence of CO generation on the environmental conditions and the design details of the motor is discussed. G.R.

**A74-10832 # The 'time factor' in the variations of hemostasis due to severe hypoxia (Le 'facteur temps' dans les variations de l'hémostase par hypoxie sévère).** M.-V. Strumza, J. Hainaut, and J. M. Strumza-Poutonnet (Paris, Université, Laboratoire de Biologie Aéronautique, Paris; Ministère des Armées, Centre de Transfusion Sanguine, Clamart, Hauts-de-Seine, France). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures.
Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 19, 20. In French. Research supported by the Direction des Recherches et Moyens d'Essais.

Results of measurements of certain parameters of hemostasis induced in anesthetized dogs for various periods of time by subjecting them to inhalation of an hypoxic gas mixture. In particular, a study is made of the effect of severe hypoxia on blood hypercoagulability. It is shown that the state of hypercoagulability following severe hypoxia is the consequence of a discharge of catecholamines and not of the hypoxia per se. Moreover, this state is temporary, lasting only a few minutes, in spite of the persistence of the oxygen deficiency, and does not result from a collapse of antithrombin activity. A.B.K.

**A74-10833 # Chemical sympathectomy and resistance to high-altitude hypoxia (Sympathectomie chimique et la résistance à l'hypoxie d'altitude).** R. Debijadji, L. Perovic, L. Markovic-Giaja, M. Hadzic, and V. Varagic (Institute of Aviation Medicine, Zemun, Yugoslavia). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 21, 22. In French.

Results of an experimental study of the effect of destruction of the sympathetic nervous system in white rats by the introduction of 6-hydroxydopamine (6-OHDA) on the survival time of the animals when exposed to hypoxic hypoxia. It is shown that 6-OHDA drastically reduces the survival time of the experimental animals under conditions of high-altitude hypoxia, in contrast to the control group, owing to the fact that it leads to a stimulation of metabolic processes, an increase in oxygen consumption, and an increase in body temperature. A.B.K.

**A74-10834 # Thermoregulatory responses during exercise at low and high altitude (Réponses thermorégulatrices au cours de l'exercise à basse et haute altitude).** J. Raynaud, H. Vieillefond, P. Varène, and J. Durand (Instituto Boliviano de Biologia de Altura, La Paz, Bolivia; Paris, Université, Département de Physiologie Humaine, Paris, France). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 23, 24. In French.

Results of a series of studies of circulatory modifications induced in two subjects who were natives of low altitude when required to perform exercise at sea level and at high altitude. The parameters measured in this case were the rectal temperature, the mean skin temperature, the difference between these two temperatures during exercise, the evaporative flow rate, and the weight loss. A.B.K.

**A74-10835 # Measurement of the degradation of human performance under the action of chronic hypoxia (Mesure de la dégradation de la performance humaine sous l'influence d'une hypoxie chronique).** B. Vettes, J. Demange, and R. Auffret (Centre

d'Essais en Vol, Brétigny-sur-Orge, Essonne, France). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 27, 28. 6 refs. In French.

Experimental study of the effects of hypoxia on the performance of a principal task of compensated visual tracking associated with a secondary task of reaction time measurement. It is shown that the alteration of individual and collective performances between the values obtained on the ground and those obtained after 50 minutes at a simulated altitude of 5000 m is significant. Moreover, the method of investigation employed, which associates two psychomotor tasks which are relatively insensitive to apprenticeship effects and are reproducible in time, is highly suitable for differentiating the effects of cerebral hypoxias of different origins. A.B.K.

**A74-10836** # **The pharmacological effect of xantinol nicotinate on man in hypoxia (Die pharmakologische Wirkung von Xantinol-Nicotinat auf den Menschen im Sauerstoffmangel).** K. Held, O. Wünsche, and N. Reuter (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg; Braunschweig, Technische Universität, Braunschweig, West Germany). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 29, 30. 7 refs. In German.

**A74-10837** # **Vascular headaches as a problem of diagnosis for flying status determination.** N. M. Krstic, V. B. Bogdanovic, and A. I. Radovic (Institute of Aviation Medicine, Zemun, Yugoslavia). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 39, 40. 8 refs.

An evaluation was conducted concerning the application of rheoencephalography (REG) as a safe and very useful method in aerospace medicine for the diagnosis of vascular headaches as neurological disabilities that can terminate flight. The results reported are based on REG studies carried out on 423 patients with vascular headaches of the migraine type, the headaches of hypertension, cerebral atherosclerosis associated with headache, and other head pains. G.R.

**A74-10838** # **The peculiarity of physiological changes during real and simulated flight in pilots with signs of atherosclerosis and hypertonia.** B. L. Gelman, G. L. Strongin, and E. M. Peshkov (Aeroflot, Moscow, USSR). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 41, 42.

**A74-10839** # **Cosmic radiation and Concorde (Rayonnements cosmiques et Concorde).** R. P. Delahaye, H. François, G. Portal, and R. Kaiser (Ministère des Armées, Service de Santé, Paris; Commissariat à l'Energie Atomique, Service Technique de Protection et de Pollution Atmosphérique, Fontenay-aux-Roses, Hauts-de-Seine; CNRS, Laboratoire de Physique Nucléaire, Strasbourg, France). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 47, 48. In French.

Description of the various types of radiation dosimeters on board the Concorde, and results of readings made from these dosimeters since December 1969. Brief descriptions are given of the dosimetric systems employed for the measurement of charged particles and heavy ions, for the measurement of neutrons, and for the measurement of electromagnetic fields and ionizing particles. The results obtained from these instruments show that the galactic cosmic radiation dose rates recorded at the cruising altitudes of Concorde are about 1 mrem/hr, ranging from 0.5 to 1.5 mrem/hr, depending on geomagnetic latitude. It is concluded that there is no radiobiological danger to the foetuses of pregnant women during flight in Concorde at cruising altitudes. A.B.K.

**A74-10840** # **Experimental study of the effects of Concorde type supersonic booms on human hearing, equilibrium, and vision (Etude expérimentale des effets des bangs supersoniques type Concorde sur l'audition, l'équilibre et la vision de l'homme).** M. Burgeat, Y. Grall, D. Loth, P. Massard, and C. Menguy (Hôpital Lariboisière, Paris, France). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 49, 50. In French.

Study of the effects of shock waves identical to those caused by Concorde on various sensory functions in humans. In particular, the effects of such simulated sonic booms on hearing were investigated by means of automatic audiometry, impedance measurements, and measurements of auditive evoked potentials, the effects on vision were studied by electrooculography, and the effects on equilibrium were evaluated by means of statokinesimetry and electromyography. It is tentatively concluded that Concorde type supersonic booms do not cause any significant sensory disorder in normal human subjects. A.B.K.

**A74-10841** # **Evaluation of tissue postmortem lactates in accident investigation using an animal model.** L. J. McBurney, W. J. Watson, and M. W. Radomski (Defence and Civil Institute of Environmental Medicine, Downsview, Ontario, Canada). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 71, 72.

**A74-10842** # **Development of post-training objectives for training pilots in handling of in-flight incapacitations.** H. W. Orlady, G. J. Kidera, and C. R. Harper (United Air Lines, Inc., Chicago, Ill.). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 73, 74.

**A74-10843** # **Adjustment in systemic and coronary circulation to reduced arterial oxygen content.** W. von Restorff (Bundesministerium der Verteidigung, Flugmedizinisches Institut, Fürstenfeldbruck, West Germany), E. Bassenge, J. Holtz, and K. Oversohl (München, Universität, Munich, West Germany). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 88, 89.

A canine model was used in an investigation of the ability of the coronary system to adjust to decreased arterial oxygen content at rest and exercise. The arterial oxygen content was lowered by a stepwise reduction of HCT by chemodilation. Nine mongrel dogs were used in the studies. The results of the studies show that the oxygen demand of the heart under the conditions tested is satisfied by vasodilation and increased oxygen extraction. G.R.

**A74-10844** # **The interaction between the intracellular pH and the arterial CO2 tension.** C. Albers, D. Lang, F. Saborowski, U. Schmidt-Schäffer, C. Scholand, and W. Usinger (Regensburg, Universität, Regensburg, West Germany). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures.

Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 90, 91. 5 refs.

Investigation of the relationship between the intracellular pH values of various organs and the arterial CO2 tension. The results obtained indicate that altering the ventilation affects the intracellular pH as well as the intracellular bicarbonate of the various organs in a specific way which has to be taken into account when the influence of the ventilation on the function of a specific organ is studied. M.V.E.

**A74-10845** # **'Inversion illusion' in the case of weightlessness ('Inversion Illusion' bei Schwerelosigkeit).** H. J. Pichler (Österreichisches Institut für Raumfahrtmedizin, Vienna, Austria). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 94-96. 19 refs. In German.

The 'inversion illusion' which occurs during transitions from conditions of normal gravity to a state of weightlessness provides new information regarding the function of the vestibular organ in space. Studies of the inversion-illusion phenomenon are discussed, giving attention to the role of the maculae of the otoliths system, investigations reported by Gerathewohl (1956), an analysis conducted by Berry and Homick (1973), and work reported by Kimura (1973). G.R.

**A74-10846** * # **Changes in the direction of sight during parabolic flights and rectilinear accelerations (Blickrichtungsänderungen bei Parabelflügen und rektilinearen Beschleunigungen).** R. von Baumgarten, R. Thümler, G. L. Shillinger, and G. Baldrighi (Michigan, University, Ann Arbor, Mich.; NASA, Ames Research Center, Moffett Field, Calif.; Mainz, Universität, Mainz, West Germany). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 97, 98. In German.

Tests in which persons were subjected to a negative acceleration in an automobile are reported. The acceleration was obtained by stopping a moving car on the runway of an airport. The acceleration was found to produce a rotational movement of the subject's eyeball proportional to the degree of acceleration. Other investigations were conducted with a jet aircraft and a sports aircraft. G forces of up to 3 G were obtained during pull up of the aircraft, while values in the range from 0 to 1 G could be produced with the aid of a parabolic flight path. The effects of the flight conditions on the subject's direction of sight are discussed. G.R.

**A74-10847** # **Continuous per-acceleratory nystagmus.** W. J. Oosterveld and L. B. W. Jongkees (Amsterdam, Universiteit, Amsterdam, Netherlands). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 99, 100. 6 refs.

Brief description of the procedures used and results obtained in an experimental study of the effects of angular accelerations applied to test subjects for periods of 30 sec or more. The study was designed to determine whether an adaptive change in the nystagmus response would result during the stimulation period. At angular accelerations of 0.25 and 0.5 deg per sec per sec, there was a clear decrease in nystagmus response respectively 90 and 60 sec after acceleration onset. At higher angular accelerations there was no change in the nystagmus response. M.V.E.

**A74-10848** # **The Biostack experiments I and II flown on board of Apollo 16 and 17.** H. Bücker, G. Horneck, H. Wollenhaupt, G. Bowman, E. Schopper, G. Henig, J.-U. Schott (Frankfurt, Universität, Frankfurt am Main, West Germany), E. Reinholz (Max-Planck-Institut für Biophysik, Frankfurt am Main, West Germany), W. Rüther, and E. H. Graul (Marburg, Universität, Marburg an der Lahn, West Germany). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures.
Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 105-110. 11 refs.

Review of the design, purpose, and preliminary results of the Biostack I and II experiments flown on board of Apollo 16 and Apollo 17. The objective of the Biostack experiment program is the study of the combined effects of heavy cosmic radiation nuclei and space flight factors on biological systems. Some of the physical and biological results observed are discussed with special attention to the little known effects of impacts of heavy high-energy particles that have lost much of their energy after their passage through matter. M.V.E.

**A74-10849** # **The effect of simulated increased gravity /chronic centrifugation/ on the immunological system of the rat.** A. J. van Wyk and H. D. Brede (Stellenbosch, University, Cape Town, Republic of South Africa). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 115, 116. 8 refs.

The response of the immunological system in rats to transplanted allogeneic tissue is decreased by chronic centrifugation. Both the humoral and cellular mechanisms seem to be affected. Lympholysis occurs during the first 3-5 days of centrifugation. The resultant lymphopenia reduces the possibility of immunocompetent clones directed against the foreign tissue, and thus increases the chance of survival of homologous graft. M.V.E.

**A74-10851** # **Modifications of the physiology of the feminine genital apparatus under the influence of flight (Les modifications de la physiologie de l'appareil génital féminin sous l'influence du vol).** M. Vasiliad and M. Anton (Centre Médical Aéronautique, Bucharest, Rumania). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures.
Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 126, 127. In French.

**A74-10852** # **What are the conditions for a utilization of electric skin resistance measurements for the clinical and experimental aerospace medicine (Unter welchen Voraussetzungen können elektrische Hautwiderstandsmessungen für die klinische und experimentelle Flugmedizin von Nutzen sein).** K. Gratzl (Deutsche Gesellschaft für Luft- und Raumfahrtmedizin, Marburg an der Lahn; Deutsche Gesellschaft für Luft- und Raumfahrt, Berlin, West Germany). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 134, 135. In German.

It is found in an evaluation of almost 100,000 skin resistance measurements that the resistance values obtained for individual dermatomes can show large differences. The data represent a projection of the neurovegetative conditions of the inner organ which is related to the skin segment on the basis of evolutionary history. Temporal resistance fluctuations provide information of great importance regarding the functional conditions within a segment of the body. Certain disturbing effects which had to be eliminated in practical clinical applications can possibly be utilized for a quantitative determination of the psychophysical stresses to which the flying personnel is subjected during flight missions. G.R.

A74-10853 # **Medical requirements for licences in international civil aviation.** A. B. Frykholm (International Civil Aviation Organization, Montreal, Canada). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures.
Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 136, 137.

A74-10854 # **X-ray studies of the heart /linear parameters and volume/ in the case of flying aptitude investigations (Röntgenuntersuchungen des Herzens /lineare Parameter und Volumen/ bei Flugtauglichkeitsuntersuchungen).** H.-J. Maurer (Tromso, Universitetet, Tromso, Norway) and H. Vitz (Bundesministerium der Verteidigung, Flugmedizinisches Institut, Fürstenfeldbruck, West Germany). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 144, 145. In German.

Thorax pictures in two planes of 230 male subjects were obtained. The linear parameters on the pictures were measured and relative heart-volume values were determined. Correlations between various groups of data were obtained in order to evaluate their significance for the roentgenographical diagnosis. On the basis of the results of the investigation it is concluded that the considered approach has only a limited value for the diagnosis of prospective pilots. G.R.

A74-10855 # **Biochemical indices of stress in parachutists.** D. H. Reid (U.S. Navy, Naval Aerospace Recovery Facility, El Centro, Calif.), B. D. Polis, H. W. Shmukler, and E. Polis (U.S. Navy, Naval Aerospace Recovery Facility, El Centro, Calif.; U.S. Naval Material Command, Naval Air Development Center, Warminster, Pa.). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 150, 151. 6 refs. Navy-supported research. Navy Task MF51,524,005-0001BA1; AIR TASK A310310C/001A/3R041.

Review of the results of analyses of body fluid constituents of test parachutists performed over the last four years with the aim of quantifying the stress endured by jumpers and for developing a success/fail predictive parachuting index. The results indicate that the excretion of o-hydroxyhippuric acid in urine is a useful addendum to the molecular determinants of stress and, under controlled conditions, may aid in identifying candidates who can or cannot succeed as test parachutists. M.V.E.

A74-10856 # **Effects of normobaric hyperoxia on certain urinary physical constants among pilots (Effets de l'hyperoxie normobare sur certaines constantes physiques urinaires chez les pilotes).** I. Pintilie and I. Nastoiu (Centre Médical Aéronautique, Bucharest, Rumania). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, Sept. 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 152, 153. In French.

The study dealt with a group of 40 young pilots, perfectly healthy, from whom urine samples were taken under specified conditions with and without oxygen inhalation. After bed rest in normoxic conditions, a significant increase of urinary pH was observed, an increase without significance in the urinary flow accompanied by a diminution, also without significance, of the urinary density and of the dried residue. After inhalation for one hour of 100 per cent oxygen, modifications occurring in the urinary physical constants were the same, but significant, with the exception of the dried residue whose individual variations led to insignificant differences. The mean values obtained as well as the significance of differences are tabulated. F.R.L.

A74-10857 # **The modifications of protective colloids and of urinary electrolytes during supersonic flights (Les modifications des colloides protecteurs et des électrolytes urinaires pendant les vols supersoniques).** T. Covaliu (Spitalul P.T.T., Bucharest, Rumania), M. Anton (Centre Médical Aéronautique, Bucharest, Rumania), and I. Marinescu (Spitalul Militar Central, Bucharest, Rumania). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 154, 155. In French.

The appearance of certain hematurias, urinary salts, and nephritic colics among aircrew, especially in the conditions of supersonic flight, led to a broad study of their lithogen potential. Protective colloids (mucoproteins) are normally found in the 24-hr urine in the proportion of 200 to 240 mgr. Results obtained during supersonic flights show that as a function of flight conditions, the aircrew present marked modifications of urinary electrolytes and protective colloids, which modifications have as a direct result the appearance of crystals in the urine, sometimes leading to the formation of urinary calculi. F.R.L.

A74-10858 # **Physiological, biochemical, and psychological responses in air traffic control personnel - Comparison of the 5-day and 2-2-1 shift rotation patterns.** C. E. Melton, J. M. McKenzie, R. C. Smith, B. D. Polis, and E. A. Higgins (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.; U.S. Naval Material Command, Naval Air Development Center, Warminster, Pa.). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 169, 170.

A74-10859 # **The physical performance of professional pilots as a function of age (Die körperliche Leistungsfähigkeit von Berufspiloten in Abhängigkeit vom Alter).** U. C. Luft (Lovelace Foundation, Albuquerque, N. Mex.). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures.
Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 173-177. 15 refs. In German.

The data investigated in a study of 415 professional pilots include values for body size and composition, pulmonary function, and physical competence. Data are considered concerning height, weight, body density, fat content, fat-free weight, total lung capacity, vital capacity, residual volume, the forced expired volume in one second, maximal mid-expiratory flow, the nitrogen clearance equivalent, lung diffusion capacity, oxygen intake, heart rate, and blood pressure. Coefficients describing the correlation of various parameters with age are presented in a table. G.R.

A74-10860 # **Use of cardiac mechanograms in the assessment of aircrew (Intérêt des mécanogrammes cardiaques dans l'expertise du personnel navigant).** R. Carré, C. Nogues, and F. Plas (Centre Principal d'Expertise Médicale du Personnel Navigant, Paris, France). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 179, 180. In French.

Mechanogram techniques are nonbleeding, are easily reproducible at each assessment, and provide graphs which are included in the dossier of each pilot, making possible the comparison of one assessment with another. Cardiac mechanograms bring three types of information: analysis of cardiac murmurs defining the variety of the cardiopathy by phonocardiography, study of the arterial distensibility by the carotidogram, and the chronocardiographic measurement of an index of systolic flow and the contraction of the myocardial muscle. F.R.L.

**A74-10861** # **The effects of premature beats on brain perfusion rate under hypoxia and positive pressure breathing.** S. I. Janes, J. M. Davidovic, and A. I. Radovic (Institute of Aviation Medicine, Zemun, Yugoslavia). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 181, 182. 7 refs.

**A74-10862** # **Bioinstrumentation of a pilot for in-flight measurements (Die Bioinstrumentierung eines Flugzeugführers für in-flight-Messungen).** R. O. Amendt, W. Buck, and K. F. Klein (Bundesministerium der Verteidigung, Flugmedizinisches Institut, Fürstenfeldbruck, West Germany). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures.
Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 183, 184. 7 refs. In German.

Problems concerning the design of suitable biotechnical approaches are considered, giving attention to general interpretation difficulties, disturbing noise signals, and questions regarding the relation between the observed physiological function and the obtained biosignal. The physiological parameters used in a study of in-flight stress reactions include EKG, pulse rate, GSR, rate of breathing, and eyelid movements. Devices designed for the observation of these parameters are discussed. G.R.

**A74-10863** # **Circulatory homeostasis in the course of flight, studied among aviators by cardiothoracic telerheogram (L'homéostasie circulatoire au cours du vol, étudiée chez les aviateurs par télé-rhéogramme cardio-thoracique).** V. Ionescu, R. Vrancianu, A. Adamache, V. Repta, and C. Balta (Academia Romana, Institutul de Fiziologie Normala si Patologica; Ministerul Transporturilor, Bucharest, Rumania). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 185, 186. In French.

**A74-10864** # **Potassium metabolism during prolonged hypodynamics.** H. Saiki, M. Nakaya, H. Mizunuma, and T. Yamauchi (Tokyo, University, Tokyo, Japan). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures.
Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 195, 196. 5 refs.

Changes in urinary excretion of potassium and sodium are investigated in three healthy human subjects during and after a 6-day long water immersion exposure. The results include the finding that the continued increase in potassium excretion in the post-immersion period is accompanied by a decrease in sodium excretion. M.V.E.

**A74-10865** # **Human standing posture under simulated hypogravity.** T. Mano, S. Mori, and G. Mitarai (Nagoya University, Nagoya, Japan). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 197, 198.

Investigation of the functional modifications of human postural reflexes under simulated hypogravity. The factors influencing the anti-gravitational mechanisms of human standing posture are explored by means of electrophysiological methods. M.V.E.

**A74-10866** # **Physiopathogenic mechanism of rachidian lesions of combat airplane pilots after ejection (Mécanisme physiopathogénique des lésions rachidiennes des pilotes d'avions de combat après éjection).** R. Auffret (Centre d'Essais en Vol, Brétigny-sur-Orge, Essonne, France), R. P. Delahaye, and P. J. Metges (Hopital d'Instruction des Armées Bégin, Saint-Mandé, Val-de-Marne, France). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 207, 208. In French.

Vertebral fractures are encountered in 15 to 25 per cent of ejections. These lesions are produced upon the start of the seat or at arrival on the ground. On starting, the fracture localizes itself at the level of the mean dorsal column or of the dorso-lumbar hinge. In order to verify the truth of various hypotheses and to elucidate the physiopathogenic mechanism, modifications of the curvature of the vertebral column were studied by radiographs carried out on subjects in ejection seats. Complex accelerations on several axes, encountered in certain losses of control of aircraft, and above all a bad position of the pilot during the start of the seat are considered to be the principal factors in vertebral accidents. F.R.L.

**A74-10867** # **Importance of the central visual field with the Friedmann apparatus in assessments of aircrew (L'intérêt du champ visuel central avec l'appareillage de Friedmann dans les expertises du personnel navigant).** J. P. Chevaleraud (Centre Principal d'Expertise Médicale du Personnel Navigant, Paris, France) and G. Perdriel. In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 212-214. In French.

**A74-10868** # **Peripheral chorioretinal lesions observed among members of the personnel of French military aeronautics (Lésions chorio-rétiniennes périphériques observées chez des membres du personnel de l'aeronautique militaire Française).** P. Manent, G. Raynaud, and R. Bru (Hôpital d'Instruction des Armées Dominique Larrey, Versailles, France). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures.
Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 217, 218. 8 refs. In French.

The systematic examination of the back of the eye often reveals chorioretinal alterations of a degenerative type between the equator and the ora, without the existence of functional signs. The number of these images of quiescent aspect and their frequency, which is sometimes very high, is surprising. The nature and frequency of these lesions among candidates and operational personnel are studied. It is considered that when equatorial degenerative lesions are found, unfitness is indicated. F.R.L.

**A74-10869** # **Monocular visual cues and space perception during the approach and landing.** R. H. Riordan (Trans World Airlines, Inc., Medical Dept., Kansas City, Mo.). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongres für Luft- und Raumfahrtmedizin, 1973, p. 219, 220. 7 refs.

Brief survey of the literature on the monocular cues utilized by pilots in the perception of depth or distance. The survey confirms the notion that the perception of depth or distance during visual approach to landing is a highly complex and integrative perceptual process involving continually changing monocular vision cues which are best described as runway perspective and runway motion parallax. M.V.E.

**A74-10870** # **Strategy of saccadic eye movements and information transmission in visual perception of length.** D. Bechinger, G. Kongehl, H. H. Kornhuber, and C. Walther (Ulm, Universität, Ulm, West Germany). In: International Congress on Aviation and

Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 223, 224. 8 refs.

It is shown that information transmission in the perception of visual length increases by only 20% from short to long presentations. Half of this increase is due to the first saccadic eye movement. The strategy of the saccades depends on both the duration and the length of stimuli. There is an inhibition of saccades to ensure undisturbed visual information processing in situation where saccades would not add further information. M.V.E.

**A74-10871 * # Quantification of the rates of resynchronization of heart rate with body temperature rhythms in man following a photoperiod shift.** N. W. Hetherington, L. S. Rosenblatt (Geneticon, Piedmont, Calif.), E. A. Higgins (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.), and C. M. Winget (NASA, Ames Research Center, Moffett Field, Calif.). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures.
Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 225, 226.

A mathematical model previously presented by Rosenblatt et al. (1973) for estimating the rates of resynchronization of individual biorhythms following transmeridian flights or photoperiod shifts is extended to estimation of rates at which two biorythms resynchronize with respect to each other. Such quantification of the rate of restoration of the initial phase relationship of the two biorhythms is pointed out as a valuable tool in the study of internal desynchronosis. M.V.E.

**A74-10872 # A simple calculator for determining the physiological rest period after jet flights involving time zone shifts.** S. J. Gerathewohl (FAA, Washington, D.C.). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures.
Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 227, 228. 6 refs.

**A74-10873 # Comparative investigations, conducted with the aid of tracking tests and physiological parameters, concerning the performance of pilots and the long-term stresses to which they are subjected (Vergleichende Untersuchungen zur Leistungsfähigkeit und Dauerbeanspruchung von Flugpiloten mit Hilfe von Trackingtests und Physiologischen Messgrössen).** H. Strasser, K.-P. Klinger, W. Müller-Limmroth, and G. Brilling (München, Technische Universität, Munich, West Germany). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 237, 238. In German.

Tracking procedures provide valuable information regarding the relation of a subject to a dynamic operational process. These procedures are basically concerned with an evaluation of dynamic motoric aspects. The evaluation of the operational performance characteristics of a pilot must be supplemented by information regarding the stresses to which the pilot is subjected while providing the performance. This information is obtained by taking into account the behavior of physiological parameters during the tests. The approaches considered have been employed in a number of investigations involving aircraft pilots and the employees of an industrial firm. G.R.

**A74-10874 # Pilot reach capability and control placement evaluation.** K. W. Kennedy (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures.
Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 247, 248.

Selected dimensions of reach envelopes are presented using an earlier and a new seat reference points. Also, an illustrated cockpit reach evaluator is briefly described. This evaluator is a portable measuring device that is set in the pilot's seat and with which horizontal and vertical angles and linear distances to hand operated controls are measured from a point 25 inches above the seat reference point. M.V.E.

**A74-10875 # Anthropometry of RAF aircrew.** G. M. Turner (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 253, 254.

Brief description of the 1970/71 anthropometric survey of RAF aircrews, and listing of the 60 body dimensions measured. The distributions of some of the body dimensions obtained in the 1955 and 1970/71 anthropometric surveys are compared. The sample investigated in the last survey comprised 2000 general duties men whose ages ranged from 18 to 45. Care was taken to ensure that the sample was representative of the RAF aircrew population as a whole with respect to the distributions of age, crew duty, and operational role. M.V.E.

**A74-10876 # Free and forced internal desynchronization of circadian rhythms.** R. Wever and R. Lund (Max-Planck-Institut für Verhaltensphysiologie, Seewiesen and Erling-Andechs, West Germany). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 256-259. 8 refs.

Results of recent research on the internal desynchronization of circadian rhythms are reviewed. They are shown to include the finding that continuously active environmental stimuli equally affect different oscillators, whereas periodically operating stimuli affect different oscillators variously. M.V.E.

**A74-10877 # Effects of simulated time zone shifts on human circadian rhythms.** M. McCally, H. M. Wegmann, R. Lund, and J. Howard (George Washington University, Washington, D.C.; Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg; Max-Planck-Institut für Verhaltensphysiologie, Erling-Andechs, West Germany). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 260-263. 15 refs. USAF-supported research.

The responses of four subjects who were studied by identical methods during both simulated and actual flight across six time zones are examined with respect to effects on circadian rhythms. The results suggest that transmeridian flights can be effectively simulated using isolation and phase shifting of environmental light. Various points of similarity and difference are discussed. M.V.E.

**A74-10878 # Accident statistics and the human factor element.** J. S. Shuckburgh (Civil Aviation Authority, Directorate of Flight Safety, London, England). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures.
Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 289-292.

Available accident statistics are used to demonstrate the continuing high level of accidents due to human error on the flight deck and, by implication, to stress the need for further research into the reason for this state of affairs. The statistics used represent a large number of accidents that have occurred in many parts of the world over a period of at least 10 years. M.V.E.

**A74-10879** # **Sudden incapacitations in flight of French civil aviation pilots /from 1948 to 1972/ (Les incapacités subites en vol des pilotes dans l'aviation civile Française /de 1948 à 1972/).** J. Raboutet (Ministère des Transports, Conseil Médical de l'Aéronautique Civile, Paris, France). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures.
Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 293-295. In French.

**A74-10881** # **Designing controllers' tasks in relation to human capabilities.** V. D. Hopkin (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures.
Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 301-304. 7 refs.

The necessity is pointed out to consider the traffic capacity of an air traffic control system and the workload of controllers in ways other than only those in which these factors have hitherto been considered in designing jobs for controllers. High workload and a certain amount of stress are not necessarily to be avoided at all costs. What is to be avoided, if possible, are excessive workloads which the controller himself cannot influence directly. Automation can make real progress towards designing tasks in relation to human capabilities if it enables the controller to have more freedom to choose the aids he will use and when he will use them. Some of the design prerequisites for such automated control equipment are discussed. M.V.E.

**A74-10882** # **The importance of the spine in the determination of flying fitness.** R.-P. Delahaye (Ministère des Armées/Air/, Paris, France). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 311-314.

Consideration of combat fitness, flight safety, and ejection survival requirements in screening aircrew candidates or servicemen for spinal integrity and medical or surgical spine conditions. Cuneiform vertebrae, epiphysitis sequelae, congenital malformations are discussed along with various spine fractures, arthroses, herniated disks, and other medical and surgical affections of the spine. Decisions concerning fitness must be based, it is felt, on the overall clinical and psychological picture. M.V.E.

**A74-10883** # **Mathematical-statistical methods for the evaluation of the spinal column and their significance for aerospace medicine (Mathematisch-statistische Methoden der Wirbelsäulenbeurteilung und ihre Bedeutung für die Flugmedizin).** A. Beck (Bundesministerium der Verteidigung, Flugmedizinisches Institut, Fürstenfeldbruck, West Germany) and J. Killus (München, Technische Universität, Munich, West Germany). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures.
Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 316-319. 14 refs. In German.

**A74-10884** # **The treatment of intractable airsickness in aircrew.** T. B. Dobie (Leeds University, Leeds, England). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 329, 330.

Description of a new approach to the treatment of intractable airsickness in aircrew trainees. The treatment consists of a combined psycho-physiological regime and the use of a rotating/tilting table subjecting the patient to incremental increases of vestibular Coriolis accelerations. This approach has yielded a high degree of success sustained over a period of several years. M.V.E.

**A74-10885** # **Internal dissociation after transmeridian flights.** H. M. Wegmann and K. E. Klein (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures.
Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 334-337. 7 refs.

Data obtained from several flight experiments on internal dissociation following transmeridian flights are presented and discussed. The results reviewed include the finding that internal dissociation, as observed after transmeridian flight, does not per se lead to an impairment of performance. M.V.E.

**A74-10886** # **Investigations regarding the problem of circadian rhythm disturbances involving flying personnel (Untersuchungen zum Problem der circadianen Rhythmusstörungen beim fliegenden Personal).** P. Kuklinski, K. E. Klein, and H. M. Wegmann (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 338, 339. 7 refs. In German.

The diurnal rhythm of performance criteria and the functions of the body in the case of 8 subjects were determined during two transatlantic flights between Frankfurt, West Germany, and Chicago, U.S. The flights involved the transfer into another time zone with a time difference of 6 hours connected with a stay of 26.5 hours in the U.S. The data were statistically evaluated according to the method reported by Bliss (1970). G.R.

**A74-10887** # **The electroencephalogram /EEG/ under acceleration stress on the centrifuge (Das Elektroencephalogramm /EEG/ unter Beschleunigungsbelastung auf der Zentrifuge).** H. Hohlweck (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany). In: International Congress on Aviation and Space Medicine, 21st, Munich, West Germany, September 17-21, 1973, Preprints of Lectures. Munich, Sekretariat, Internationaler Kongress für Luft- und Raumfahrtmedizin, 1973, p. 342, 343. 6 refs. In German.

An investigation involving 10 male subjects was conducted concerning the relation between the time of day and the acceleration tolerance. The investigation consisted of preliminary and main tests. During the preliminary tests the subjects were to get used to the test conditions. The EEG together with other physiological parameters was determined during the main tests. During the tests the subject was sitting within a closed centrifuge container on the pilot's seat of a modern fighter aircraft. G.R.

**A74-10909** **Maxwellian view stimulator for electrophysiological or psychophysical work.** W. S. Baron (Rochester, University, Rochester, N.Y.). *Applied Optics*, vol. 12, Nov. 1973, p. 2560-2562. Grant No. NIH-EY-00187-18.

Description of a three-channel Maxwellian view stimulator which can be used in electrophysiological and psychophysical studies of animal and human visual systems. Its features include a 10-deg field with a 150-mm working distance, a remote control system for spectral, temporal and intensity variables, and a sinusoidal flicker capability. Working drawings of the stimulator are included. The instrument is used in studies of late receptor potentials in primates and is intended for use in related psychophysical studies. V.Z.

**A74-11007** **Potassium induced relaxation of vascular smooth muscle - A possible mechanism of exercise hyperaemia.** G. Biamino and H.-J. Wessel (Berlin, Freie Universität, Berlin, West Germany). *Pflügers Archiv*, vol. 343, no. 2, 1973, p. 95-106. 30 refs. Deutsche Forschungsgemeinschaft Grant No. Bi-122/3.

A74-11060 * # **Polarizability calculations on water, hydrogen, oxygen, and carbon dioxide.** S. Nir, S. Adams, and R. Rein (Roswell Park Memorial Institute; New York, State University, Buffalo, N.Y.). *Journal of Chemical Physics*, vol. 59, Sept. 15, 1973, p. 3341-3355. 46 refs. Grant No. NGR-33-015-002.

A semiclassical model of damped oscillators is used as a basis for the calculation of the dispersion of the refractive index, polarizability, and dielectric permeability in water, hydrogen, and oxygen in liquid and gaseous states, and in gaseous carbon dioxide. The absorption coefficient and the imaginary part of the refractive index are also calculated at corresponding wavelengths. A good agreement is obtained between the observed and calculated values of refractive indices, and between those of absorption coefficients in the region of absorption bands. The calculated values of oscillator strengths and damping factors are also discussed. The value of the polarizability of liquid water was about 2.8 times that of previous calculations. V.Z.

A74-11167 **Ergonomics in control.** E. Edwards (Loughborough University of Technology, Loughborough, Leics., England). *IEE Reviews*, vol. 120, Oct. 1973, p. 1181-1192. 39 refs.

Ergonomics is the technology concerned with the application of the human sciences to problems of the effective deployment of manpower. An attempt is made to outline the history and scope of ergonomics and to indicate the types of problems which arise, and the general way in which solutions are approached. A brief account is given of the nature of human abilities and the ways in which such knowledge should be applied to the design of equipment and systems. Ergonomics and control interfaces, human operator input characteristics, display design, human operator output characteristics, the grouping of displays and controls, some general features of human skill, dynamic display-control relationships, manual control, system design, and man-computer dialogue are considered. The present and future of ergonomics is discussed. F.R.L.

A74-11203 # **Automated air quality measuring networks.** E. Wenk. *Dornier-Post* (English Edition), no. 3, 1973, p. 5-9.

The main objects of monitoring air quality are to provide a constant check on the degree of pollution in the atmosphere and thus to warn of hazards, to ascertain the causes of such pollution, and to prepare and apply suitable measures to reduce the emission of pollutants. The present trend in air quality monitoring is toward automatically operating measuring networks consisting of a number of measuring stations arranged in a specific pattern. The data acquired from the various pollutant sensors at a station are transmitted to a central station and there evaluated. The construction of a network and the operation of measuring stations and the center in a measuring network are outlined. F.R.L.

A74-11220 # **Passive occupant restraints - Gas generators saving lives.** C. Y. Warner (Brigham Young University, Provo, Utah). *American Institute of Aeronautics and Astronautics and Society of Automotive Engineers, Propulsion Conference, 9th, Las Vegas, Nev., Nov. 5-7, 1973, AIAA Paper 73-1170*. 8 p. 33 refs. Members, $1.50; nonmembers, $2.00.

Use of appropriate restraint systems can provide significant reductions in fatalities and injuries to occupants of vehicles involved in crashes. Accident data and biomechanic tests suggest that contemporary restraints, if used, could reduce fatalities by as much as 40 percent and that proposed passive restraints, now in limited fleet trails, could make even greater reductions. Engineering analyses and crash tests have demonstrated that properly designed restraint systems and vehicle structures can make most crashes survivable. Gas generator systems now in limited production for air cushion inflator system are helping to bring automatic, passive occupant restraints systems into general production. (Author)

A74-11346 **An analysis of deaths occurring in association with coronary arteriography.** T. Takaro, H. N. Hultgren, D. Littmann, and E. C. Wright (U.S. Veterans Administration Hospital, Oteen, N.C.). *American Heart Journal*, vol. 86, Nov. 1973, p. 587-597. 44 refs.

A74-11347 **Coronary arteriographic findings in patients with axis shifts or S-T-segment elevations on exercise-stress testing.** F. N. Hegge, N. Tuna, and H. B. Burchell (Minnesota, University, Minneapolis, Minn.). *American Heart Journal*, vol. 86, Nov. 1973, p. 603-615. 18 refs. Grant No. NIH-HL-08527-09.

A74-11349 **Evaluation of an abilities classification system for integrating and generalizing human performance research findings - An application to vigilance tasks.** J. M. Levine, T. Romashko, and E. A. Fleishman (American Institutes for Research, Washington, D.C.). *Journal of Applied Psychology*, vol. 58, Oct. 1973, p. 149-157. 11 refs. Army-sponsored research.

A74-11350 **Effects of sleep loss and stress upon radar watching.** B. Bergstrom, M. Gillberg, and P. Arnberg (Institute of Military Psychology, Stockholm, Sweden). *Journal of Applied Psychology*, vol. 58, Oct. 1973, p. 158-162. 9 refs. Research sponsored by the Swedish Armed Forces.

A74-11377 # **Extravehicular space suit system for Apollo and Skylab missions.** J. D'Andrade and R. D. Jones (ILC Industries, Inc., Dover, Del.). *American Institute of Aeronautics and Astronautics, Crew Equipment Systems Conference, Las Vegas, Nev., Nov. 7-9, 1973, Paper 73-1328*. 8 p. Members, $1.50; nonmembers, $2.00.

During the Apollo and Skylab Programs, pressure suits provided man with the vehicle to perform extravehicular activities on the lunar surface and in free space. Systems and components of the suits were designed to provide structural integrity against man-induced loads and suit operating pressures, provide mobility and comfort, and to accommodate custom sizing. Suit systems, including cooling, thermal protection, waste management, communications, bioinstrumentation and ventilation were designed to interface and human factors requirements. Experiences gained during the Apollo and Skylab Programs are being utilized to develop new and improved system and component suit designs for future space missions. (Author)

A74-11378 * # **Apollo PLSS - A criterion for space back pack equipment.** F. H. Goodwin (United Aircraft Corp., Hamilton Standard Div., Windsor Locks, Conn.). *American Institute of Aeronautics and Astronautics, Crew Equipment Systems Conference, Las Vegas, Nev., Nov. 7-9, 1973, Paper 73-1329*. 10 p. Members, $1.50; nonmembers, $2.00. NASA-supported research.

Description of the Portable Life Support System (PLSS) used to support the astronauts during the six lunar surface excursions of the Apollo Program. The basic requirements imposed on the system are reviewed, the system and its capability are described, overall program performance is assessed, and the significant experience gained which can be applied to life support system programs of the future is discussed. (Author)

A74-11379 # **ALSA evolution.** J. B. Gillerman (AiResearch Manufacturing Co., Los Angeles, Calif.). *American Institute of Aeronautics and Astronautics, Crew Equipment Systems Conference, Las Vegas, Nev., Nov. 7-9, 1973, Paper 73-1330*. 10 p. Members, $1.50; nonmembers, $2.00.

Description of the Astronaut Life Support Assembly (ALSA) which has been developed as an umbilically-supplied open-loop system providing easier donning and doffing, simplicity in checkout, and compactness to ease astronauts' operations in closely confined areas of the Apollo Telescope Mount. The Assembly includes a Life Support Umbilical, a waist mounted Pressure Control Unit, and a leg mounted Secondary Oxygen Pack. V.Z.

A74-11380 * # **EVA crew workstation provisions for Skylab and Space Shuttle missions.** N. E. Brown (URS/Matrix Co., Life and Environmental Sciences Div., Houston, Tex.) and E. L. Saenger (URS/Matrix Co., Man Systems Div., Huntsville, Ala.). *American*

*Institute of Aeronautics and Astronautics, Crew Equipment Systems Conference, Las Vegas, Nev., Nov. 7-9, 1973, Paper 73-1331.* 15 p. 8 refs. Members, $1.50; nonmembers, $2.00. Contracts No. NAS9-12997; No. NAS8-25627.

A synopsis of scheduled extravehicular activities (EVA) for a nominal Skylab mission is presented with an overview of EV workstation equipment developed for the program. Also included are the unprogrammed extravehicular activities and supporting equipment that was quickly developed and retrofitted in a series of successful operations to salvage the crippled Skylab Cluster during the Skylab 1 Mission. Because EVA appears to be a requirement for the Space Shuttle Program, candidate EV workstations are discussed in terms of effective and economical Shuttle payload servicing and maintenance. Several such concepts, which could provide a versatile, portable EV support system, are presented. (Author)

**A74-11381 * #** **Shuttle extravehicular life support equipment.** J. G. Sutton (United Aircarft Corp., Hamilton Standard Div., Windsor Locks, Conn.). *American Institute of Aeronautics and Astronautics, Crew Equipment Systems Conference, Las Vegas, Nev., Nov. 7-9, 1973, Paper 73-1333.* 10 p. Members, $1.50; nonmembers, $2.00. Contract No. NAS9-12506.

A Shuttle EVA/IVA Requirements Study was conducted by Hamilton Standard for NASA. The objectives of this study were to establish a baseline EVA approach for Shuttle and to prepare requirements for the EVA equipment required to support these operations. This paper presents the results of the EVA life support requirements definition effort and defines candidate configurations which meet these requirements. Various subsystem and system concepts were identified and evaluated to determine the most desirable approaches. Both independent and umbilical configurations are considered. Because certain EVA missions could involve contamination-sensitive payloads, the impact of integrating non-contaminating equipment is also considered. (Author)

**A74-11382 * #** **Advanced high efficient liquid transport garments.** W. Elkins (Acurex Corp., Mountain View, Calif.) and W. Williams (NASA, Ames Research Center, Moffett Field, Calif.). *American Institute of Aeronautics and Astronautics, Crew Equipment Systems Conference, Las Vegas, Nev., Nov. 7-9, 1973, Paper 73-1334.* 3 p. Members, $1.50; nonmembers, $2.00.

The heat transfer characteristics, design, fabrication, and current and anticipated applications of a new liquid transport garment (LTG) are discussed. The new LTG is being constructed from highly efficient liquid transport modules which have been developed to replace the current tygon tubing networks for applications in Apollo and other liquid cooling garment designs. V.Z.

**A74-11383 #** **Development of high-pressure suits for advanced missions.** J. F. Rayfield (ILC Industries, Inc., Dover, Del.). *American Institute of Aeronautics and Astronautics, Crew Equipment Systems Conference, Las Vegas, Nev., Nov. 7-9, 1973, Paper 73-1335.* 3 p. Members, $1.50; nonmembers, $2.00.

Prototype space suits are being developed to operate at pressures up to 8 PSIG, as the result of plans to use a sea level cabin atmosphere in advanced space vehicles, such as the Shuttle orbiter. This higher operating pressure capability (previous suits operated at 3.5 to 4.0 PSIG) can eliminate possible decompression sickness in event of cabin pressure loss and could also eliminate the requirement for denitrogenation prior to extravehicular activities. Two suit configurations are being developed, one for emergency intravehicular use and one for planned extravehicular activities. The two designs are hybrids of state-of-the art and advanced technology, in both components and materials. (Author)

**A74-11384 #** **An advanced sublimator for active space heat rejection.** D. L. Curtis and C. E. Oelker (Curtis-Le Vantine and Associates, Tarzana, Calif.). *American Institute of Aeronautics and Astronautics, Crew Equipment Systems Conference, Las Vegas, Nev., Nov. 7-9, 1973, Paper 73-1337.* 11 p. Members, $1.50; nonmembers, $2.00.

Discussion of the engineering aspects of the development of an advanced self-regulating sublimator for active heat rejection on the Shuttle Orbiter vehicle. A distinguishing feature of this device is the use of open-cell foam in place of porous metal for separation of the sublimation regions from the control regions to eliminate the performance degradation typical of porous-metal sublimators. The advantages of this sublimator design are listed. V.Z.

**A74-11385 * #** **Ice Pack Heat Sink Subsystem - Phase I.** G. J. Roebelen, Jr. (United Aircraft Corp., Hamilton Standard Div., Windsor Locks, Conn.). *American Institute of Aeronautics and Astronautics, Crew Equipment Systems Conference, Las Vegas, Nev., Nov. 7-9, 1973, Paper 73-1338.* 8 p. Members, $1.50; nonmembers, $2.00. Contract No. NAS2-7011.

This paper describes the design and test at one-g of a functional laboratory model (non-flight) Ice Pack Heat Sink Subsystem to be used eventually for astronaut cooling during manned space missions. In normal use, excess heat in the liquid cooling garment (LCG) coolant is transferred to a reusable/regenerable ice pack heat sink. For emergency operation, or for extension of extravehicular activity mission time after all the ice has melted, water from the ice pack is boiled to vacuum, thereby continuing to remove heat from the LCG coolant. This subsystem incorporates a quick connect/disconnect thermal interface between the ice pack heat sink and the subsystem heat exchanger. (Author)

**A74-11386 * #** **Study of regenerable CO2 sorbents for extravehicular activity.** G. V. Colombo (Umpqua Research Co., Myrtle Creek, Ore.). *American Institute of Aeronautics and Astronautics, Crew Equipment Systems Conference, Las Vegas, Nev., Nov. 7-9, 1973, Paper 73-1339.* 10 p. 6 refs. Members, $1.50; nonmembers, $2.00. Contract No. NAS2-6959.

Studies have shown that frequent extravehicular activities planned for future space missions will require regenerable life support systems. The oxides of magnesium, zinc, and silver were tested for their ability to react with CO2 to form the corresponding carbonates, and subsequent thermal regeneration to the oxides. Catalysts and binders were investigated to enhance CO2 sorption rates and structural integrity. A silver oxide formulation was developed which rapidly absorbs 95% of its theoretical capacity and has shown no degradation through 28 regenerations. (Author)

**A74-11388 #** **The encapsulating life raft system.** C. S. Jencks and D. N. DeSimone (U.S. Naval Material Command, Naval Air Development Center, Warminster, Pa.). *American Institute of Aeronautics and Astronautics, Crew Equipment Systems Conference, Las Vegas, Nev., Nov. 7-9, 1973, Paper 73-1341.* 9 p. Members, $1.50; nonmembers, $2.00.

The encapsulating life raft system has been developed as an emergency flotation platform, for the purpose of substantially increasing water survivability, for downed aircrewmen, of ejection seat type aircraft. Actuation of this system during parachute descent, results in the aviator becoming rapidly and completely enclosed within the raft system, prior to water impact. Water immersion of the aviator is effectively prevented, thereby, greatly eliminating the survival hazards associated with parachute entanglement, raft boarding, and physiological degradation caused by cold water exposure. With the demonstrated ability of this system to prevent water immersion of the man, this life raft has become an essential component in the development of a passive, fully integrated survival system, that expectantly will eliminate the need for cumbersome cold weather anti-exposure garments. Verification of both the life raft's feasibility and reliability has been proven in an extensive test program. (Author)

**A74-11389 #** **The application of thermal sealing to aircrewman's inflatable protective equipment.** R. Z. Snyder (U.S. Naval Material Command, Naval Air Development Center, Warminster, Pa.). *American Institute of Aeronautics and Astronautics, Crew Equip-*

*ment Systems Conference, Las Vegas, Nev., Nov. 7-9, 1973, Paper 73-1342.* 6 p. 5 refs. Members, $1.50; nonmembers, $2.00.

Discussion of the construction and qualities of polyurethane-coated nylon fabric of different weight with thermal seaming as an attractive alternative to the present airman protective equipment of neoprene-coated nylon with a cold cementing procedure. Dielectric and ultrasonic thermal sealing techniques, equipment, and final assembly criteria are investigated in order to reduce weight without a seam strength sacrifice in the new protective equipment. V.Z.

**A74-11390** # **Life saving equipment that kills or the need for development of the Navy's Man/Safe System.** J. F. Kenton, Jr. and W. J. Zarkowski, Jr. (U.S. Naval Material Command, Naval Air Development Center, Warminster, Pa.). *American Institute of Aeronautics and Astronautics, Crew Equipment Systems Conference, Las Vegas, Nev., Nov. 7-9, 1973, Paper 73-1343.* 4 p. Members, $1.50; nonmembers, $2.00.

A life saving system which, upon water entry, will automatically release the parachute of a Navy pilot, and simultaneously inflate his life vest is described. The system uses cartridge operated devices, initiated by an electric signal, to operate the fittings. The remaining system components - a battery, a signal processor, and a capacitor - are carried in the pilot's seat kit. After certain improvements, the need for which was indicated by preliminary tests, the system operated with satisfactory reliability. V.P

**A74-11391** # **Aircrew module environmental control system.** W. L. Loudon (U.S. Naval Material Command, Naval Air Development Center, Warminster, Pa.). *American Institute of Aeronautics and Astronautics, Crew Equipment Systems Conference, Las Vegas, Nev., Nov. 7-9, 1973, Paper 73-1344.* 4 p. Members, $1.50; nonmembers, $2.00.

An investigation into the design of an aircrew module environmental control system is summarized. This environmental control system will maintain the correct oxygen concentration, temperature, humidity, and gas pressure within the aircrew module. Provisions are made for nitrogen and carbon dioxide removal. The purpose of this system is to allow the airman to remove from his person protective and survival equipment with which he is encumbered. Open and closed loop systems were considered. The oxygen generator, purification and comfort unit, exhaust pressure control valve, inlet mixture control valve, and emergency pressurization concepts are discussed. (Author)

**A74-11392** # **High g effects upon pilot performance.** F. J. Formeller (U.S. Naval Material Command, Naval Air Development Center, Warminster, Pa.). *American Institute of Aeronautics and Astronautics, Crew Equipment Systems Conference, Las Vegas, Nev., Nov. 7-9, 1973, Paper 73-1345.* 5 p. 8 refs. Members, $1.50; nonmembers, $2.00.

Review of recent advances in the development of anti-g protection techniques for the alleviation of the physiological problems of pilots during high-speed flights. Several types of protective suits and methods of breathing developed for this purpose are described. The production of a film to demonstrate the acceleration problems to pilots is also noted. V.Z.

**A74-11393** # **Performance characteristics of a demand type phase dilution system.** R. M. Hamilton (Robertshaw Controls Co., Anaheim, Calif.). *American Institute of Aeronautics and Astronautics, Crew Equipment Systems Conference, Las Vegas, Nev., Nov. 7-9, 1973, Paper 73-1346.* 5 p. Members, $1.50; nonmembers, $2.00.

Demand type phase dilution systems offers certain advantages over the more common injector type diluter regulators. While mechanically simple, the performance of such a system is relatively complex. The interation of air valve, reservoir, regulator and controller must be considered carefully to achieve the desired results. This paper discusses these variables and presents the results of laboratory testing of a prototype system. Tests were conducted to explore the effects of tidal volume, minute volume, reservoir volume and oxygen bleed rate. (Author)

**A74-11394** # **The modular anti-exposure system.** R. L. Bell and D. N. DeSimone (U.S. Naval Material Command, Naval Air Development Center, Warminster, Pa.). *American Institute of Aeronautics and Astronautics, Crew Equipment Systems Conference, Las Vegas, Nev., Nov. 7-9, 1973, Paper 73-1347.* 8 p. Members, $1.50; nonmembers, $2.00.

The NAVAIRDEVCEN (Naval Air Development Center) is developing a modular anti-exposure system that will eliminate the necessity for cumbersome constant-wear garments which tend to hinder aircrewman performance. The major components of this system are a lightweight constant-wear liquid loop garment, an encapsulating life raft, and a thermoelectric portable power plant. The full length liquid loop garment, worn integrally with a lightweight coverall, is substantially the basic clothing configuration required by the airman for a normal mission. In the event of ejection, the encapsulating life raft deploys and completely encloses the airman inside during parachute descent. The portable power plant, which requires no batteries for its operation, simultaneously provides heat energy for warming the downed survivor, and electrical energy for operation of a survival radio. Results are presented which indicate adequate performance of the system in maintaining a survivor for up to 24 hours in an extremely low temperature environment. (Author)

**A74-11395** # **In-flight oxygen generation for aircraft breathing systems.** E. J. Boscola (U.S. Naval Material Command, Naval Air Development Center, Warminster, Pa.). *American Institute of Aeronautics and Astronautics, Crew Equipment Systems Conference, Las Vegas, Nev., Nov. 7-9, 1973, Paper 73-1348.* 6 p. 5 refs. Members, $1.50; nonmembers, $2.00.

Operational and logistics problems associated with liquid oxygen (LOX) breathing supply systems have shown the need for developing methods of generating oxygen directly on board the aircraft for aircrew breathing. Concepts presently being developed are based upon fluorine chemical sorbent and electrochemical concentrator processes. The fluorine sorbent process is a temperature cycled chemical system using the fluorine for reversibly sorbing oxygen from engine bleed air. The electrochemical process uses a combination fuel cell and electrolysis cell reaction to generate oxygen. Oxygen from an air stream is reduced on the cathode to form water, the water is then electrolyzed at the anode to evolve pure gaseous oxygen. With the aid of necessary aircraft resources (electrical power, air, heating and cooling), these techniques extract oxygen directly from engine bleed air during all flight operations. (Author)

**A74-11472** * **On the feasibility of closed-loop control of intra-aortic balloon pumping.** J. W. Clark, Jr., H. M. Bourland (Rice University, Houston, Tex.), and G. R. Kane (Tulsa, University, Tulsa, Okla.). *IEEE Transactions on Biomedical Engineering,* vol. BME-20, Nov. 1973, p. 404-412. 16 refs. Grants No. NIH-HE-09251; No. NIH-5-S04-RR-06136-03; No. NGT-44-006-003.

A closed-loop control scheme for the control of intra-aortic balloon pumping has been developed and tested in dog experiments. A performance index reflecting the general objectives of balloon-assist pumping is developed and a modified steepest ascent control algorithm is utilized for the selection of a proper operating point for the balloon during its pumping cycle. This paper attempts to indicate the feasibility of closed-loop control of balloon pumping, and particularly its flexibility in achieving both diastolic augmentation of mean aortic pressure and control of the level of end-diastolic pressure (EDP) - an important factor in reducing heart work. (Author)

**A74-11473** **Straight-line approximation for the boundary of the left ventricular chamber from a cardiac cineangiogram.** T. Kaneko (IBM Thomas J. Watson Research Center, Yorktown Heights, N.Y.) and P. Mancini (Scuola Normale Superiore; Laboratorio di Fisiologia Clinica, Pisa, Italy). *IEEE Transactions on Biomedical Engineering,* vol. BME-20, Nov. 1973, p. 413-416. 6 refs.

**A74-11474** **A comparative study of various single-plane cineangiocardiographic methods to measure left-ventricular volume.**

W. P. Santamore, P. R. Lynch (Temple University, Philadelphia, Pa.), and F. N. DiMeo (Drexel University, Philadelphia, Pa.). *IEEE Transactions on Biomedical Engineering*, vol. BME-20, Nov. 1973, p. 417-421. 8 refs. Grants No. NIH-HL-08886-09; No. NIH-HL-05417-12.

**A74-11475** **A nonstationary analysis of the electroencephalogram.** N. Kawabata (Ministry of International Trade and Industry, Tokyo, Japan). *IEEE Transactions on Biomedical Engineering*, vol. BME-20, Nov. 1973, p. 444-452. 14 refs. NSF Grants No. GB-30498; Grants No. NIH-NS-8498; No. NIH-NS-2501; No. NIH-RR-3.

A statistical technique is described which allows description of the statistical characteristics of nonstationary electroencephalograms (EEG's). The EEG is investigated in terms of its nonstationary power spectrum. The instantaneous power spectra of certain transition processes in the EEG (the evolution and blocking of the alpha wave) are calculated and described on the time-frequency plane. When the eyes are closed, there is at first a significant increase in power in the band of 10-12 Hz, and the power is gradually concentrated in the center frequency, which in turn shifts to a lower frequency. When the eyes are opened, alpha activity is blocked, the power of the alpha wave decreases, and the center frequency rapidly increases without dispersion of the power around the center frequency. A model is given which may explain the experimental results. (Author)

**A74-11626** **Visual evoked potentials estimated by 'Wiener filtering.'** T. Nogawa, K. Katayama (Nogawa Clinic of Neurosurgery, Osaka, Japan), Y. Tabata (Osaka University, Osaka, Japan), T. Kawahara, and T. Ohshio (Kyoto University, Kyoto, Japan). *Electroencephalography and Clinical Neurophysiology*, vol. 35, Oct. 1973, p. 375-378. 10 refs.

An optimum filtering method devised by Walter (1969) on the basis of Wiener's (1949) approximation theory of stationary time series is applied with the aid of a general-purpose digital computer to the estimation of visual evoked potentials over the scalp. The Wiener-filtered results and the conventional ensemble-averaged data are compared, and it is shown that the former are more smooth and simple in wave form than the latter. M.V.E.

**A74-11742** # **Positional illusions and optical deceptions (Lageillusionen und optische Täuschungen).** I. Lehwess-Litzmann. (*Verkehrsmedizin und ihre Grenzgebiete*, vol. 19, no. 9, 1972, p. 315-318.) *Technisch-ökonomische Informationen der zivilen Luftfahrt*, vol. 9, no. 5, 1973, p. 278-281. 10 refs. In German.

Mach (1975) has shown that the perceived vertical is the resultant of the force of gravity and the centrifugal force. Changes in the direction of the resultant force can produce optical illusions. Physiological effects of angular accelerations on a pilot are considered. Visual deceptions due to rotational accelerations on the centrifuge were experimentally investigated by Graybiel and Hupp (1946). Unusual aircraft accidents have been traced to illusions produced in pilots during certain flight situations. G.R.

**A74-11772** * **Possibilities for the evolution of the genetic code from a preceding form.** T. H. Jukes (California, University, Berkeley, Calif.). *Nature*, vol. 246, Nov. 2, 1973, p. 22-26. 14 refs. NASA-supported research.

Analysis of the interaction between mRNA codons and tRNA anticodons suggests a model for the evolution of the genetic code. Modification of the nucleic acid following the anticodon is at present essential in both eukaryotes and prokaryotes to ensure fidelity of translation of codons starting with A, and the amino acids which could be coded for before the evolution of the modifying enzymes can be deduced. (Author)

**A74-11786** # **Negative potentials of direct cortical response in unanesthetized cats during hypothermia (Otritsatel'nye potentsialy priamogo otveta kory u nenarkotizirovannykh koshek pri gipotermii).** T. Sh. Labakhua (Akademiia Nauk Gruzinskoi SSR, Institut Fiziologii, Tiflis, Georgian SSR). *Akademiia Nauk Gruzinskoi SSR, Soobshcheniia*, vol. 71, Aug. 1973, p. 449-452. 8 refs. In Russian.

**A74-11804** # **The bioelectret effect (Bioelektretnyi effekt).** E. T. Kulin (Akademiia Nauk Belorusskoi SSR, Institut Genetiki i Tsitologii, Belorussian SSR). *Akademiia Nauk BSSR, Doklady*, vol. 17, Sept. 1973, p. 867-870. 6 refs. In Russian.

Techniques are discussed for detecting a mechanism which generates electric fields in the human body and is hypothetically related to polarization of tissues and is sustained by biological processes. The detection is executed by the measurement of the potentials of infra-LF fields during the oscillatory motion of the arms of sublects. The persistence of such potentials after the wetting of the skin with water and solutions of salts is demonstrated. V.Z.

**A74-11812** **May users of heart pacemakers participate in air traffic (Dürfen Träger von Herzschrittmachern am Flugverkehr teilnehmen).** H. Hohlweck (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesburg, West Germany). *DFVLR-Nachrichten*, Oct. 1973, p. 475, 476. In German.

An experimental investigation was conducted to find out whether the users of heart pacemakers would experience any physiological effects due to the electronic environment on board of an aircraft. In the investigation, the EKG of a number of subjects was observed under various conditions to which a person could be exposed while making a flight. Studies on the ground were supplemented by investigations during actual flights. No detrimental effects on the subjects were observed under any of the conditions of the tests. It was also found that the pacemakers did not produce any disturbing effects concerning the communication between aircraft personnel and the airport control tower. G.R.

**A74-11870** **The effect of increased metabolic rate and denervation on CO2 storage in muscle.** A. R. D. Giordano, P. G. Tuteur, G. S. Longobardo, and N. S. Cherniack (Pennsylvania, University, Philadelphia, Pa.; IBM Corp., Advanced Systems Development Div., Yorktown Heights, N.Y.). *Respiration Physiology*, vol. 18, Sept. 1973, p. 309-327. 38 refs. Grants No. NIH-HL-08805; No. NIH-HL-05896.

**A74-11871** **Immediate ventilatory response to elastic loads and positive pressure in man.** C. E. Margaria, S. Iscoe, L. D. Pengelly, J. Couture, H. Don, and J. Milic-Emili (McGill University; Royal Victoria Hospital, Montreal, Canada). *Respiration Physiology*, vol. 18, Sept. 1973, p. 347-369. 21 refs. Research supported by the Defence Research Board and Medical Research Council of Canada.

The immediate effects of elastic loading and of continuous positive-pressure breathing on ventilation were studied in three subjects while conscious and anesthetized. The tidal volume stability during the first elastically loaded breath was found to be greater in the anesthetized than in the conscious state, reflecting a greater 'effective' elastance of the respiratory system in the former condition. During anesthesia acute exposure to positive-pressure breathing caused a decrease in respiratory frequency and a more marked decrease in tidal volume. F.R.L.

**A74-11872** **On mathematical analysis of gas transport in the lung.** H.-K. Chang and L. E. Farhi (New York, State University, Buffalo, N.Y.). *Respiration Physiology*, vol. 18, Sept. 1973, p.

370-385. 18 refs. USAF-supported research; Contract No. N00014-68-A-0216, NR Project 101-722.

The process of gas transport in the lung, involving two mechanisms, i.e., mass convection and molecular diffusion, may be analyzed mathematically. Several such analyses, taking the classical approach, the random walk approach and a nodal analysis, are reviewed. A detailed comparison, based on the physical model, the mathematical representation of the physical model, the method of solution, and the final results, is made for these analyses. The underlying assumptions of these analyses are also critically examined and suggestions for possible improvement are made. (Author)

**A74-11873** **A model study of gas diffusion in alveolar sacs.** H.-K. Chang, R. T. Cheng, and L. E. Farhi (New York, State University, Buffalo, N.Y.). *Respiration Physiology*, vol. 18, Sept. 1973, p. 386-397. 10 refs. USAF-supported research; NSF Grant No. GK-11687; Contract No. N00014-68-A-0216. NR Project 101-722.

Models of alveolar sacs with individual alveoli attached have been studied for their diffusion properties. Radial as well as axial diffusion are considered. The axisymmetric diffusion equation is solved numerically by finite element method. Parametric studies are made to determine the effects of the individual alveoli on the equilibrium time. For the models used, the results differ by about 70%. The diffusion equilibrium time for an interface 0.48 cm away from the terminal alveolar wall is between 2.4 and 3.1 sec, for the models used, which are likely to be lower estimates than the real case. Based on these numbers and arguments, it is felt that the stratification of alveolar air during quiet breathing is a definite possibility. (Author)

**A74-11902** **The influence of direction of gaze on the human electroretinogram recorded from periorbital electrodes - A study utilizing a summating technique.** B. D. Noonan, R. J. Wilkus, G. E. Chatrian, and E. Lettich (Washington, University, Seattle, Wash.). *Electroencephalography and Clinical Neurophysiology*, vol. 35, Nov. 1973, p. 495-502. 14 refs. Research supported by the University of Washington; Grant No. PHS-NB-04053-10.

**A74-11903** **Cortical habituation response to coloured lights and its relation to perception of stimulus duration.** M. R. Ali (Dacca, University, Dacca, Bangladesh). *Electroencephalography and Clinical Neurophysiology*, vol. 35, Nov. 1973, p. 550-552. 10 refs.

**A74-11914** **Exchange thresholds in dichromats.** W. A. H. Rushton, D. S. Powell, and K. D. White (Florida State University, Tallahassee, Fla.). *Vision Research*, vol. 13, Nov. 1973, p. 1993-2002. 16 refs. NSF Grant No. GU-2612; Contract No. AT(40-1)-2690; Grant No. NIH-1-RO1-EY-00684-01-VIS.

The principle of univariance states that the intrinsic response of a receptor depends upon its effective quantum catch but not upon what quanta are caught. Light of intensity I sub 1 at wavelength lambda sub 1 is suddenly exchanged for I sub 2 at lambda sub 2. The exchange is attenuated to threshold by a photometric wedge. When I sub 1 is kept fixed and I sub 2 varied in intensity, the relation between threshold and I sub 2 for dichromats fits the curve expected from Weber's law and the principle of univariance. For normal eyes the threshold is nearly the same as that for the protanope or deuteranope, whichever is lower. F.R.L.

**A74-11915** **The spectral sensitivity of 'red' and 'green' cones in the normal eye.** W. A. H. Rushton, D. S. Powell, and K. D. White (Florida State University, Tallahassee, Fla.). *Vision Research*, vol. 13, Nov. 1973, p. 2003-2015. 14 refs. NSF Grant No. GU-2612; Contract No. AT(40-1)-2690; Grant No. NIH-1-R01-EY-00684-VIS.

The technique of 'exchange thresholds' is used to determine the spectral sensitivity of the two cone pigments active in the red-green spectral range of the normal eye. The technique finds for one visual pigment its isolept, i.e., the relative energies of the two exchanging lights from which that pigment absorbs equally. Light at 540 nm of fixed intensity is exchanged for light at 640 nm, and is adjusted in intensity so that the visual pigment investigated absorbs equally from each light. This condition is the isolept for that pigment, with those lights. In a second experiment use was made of Mitchell's and Rushton's (1971b) 'analytical anomaloscope' to match lights of various wavelengths by a suitable mixture of light at 540 nm and 640 nm adjusted in intensity to the isolept for the pigment investigated. F.R.L.

**A74-11916** **Pigments in anomalous trichromats.** W. A. H. Rushton, D. S. Powell, and K. D. White (Florida State University, Tallahassee, Fla.). *Vision Research*, vol. 13, Nov. 1973, p. 2017-2031. 17 refs. NSF Grant No. GU-2612; Contract No. AT(40-1)-2690; Grant No. NIH-1-R01-EY-00684-01-VIS.

Protanomalous and deuteranomalous subjects must have an abnormal cone pigment to account for their rejection of the normal Rayleigh equation (red + green = yellow). The technique of exchange thresholds as used to determine what it is. With the protanomalous, the red intensity was set so that a protanope could not detect the change from red to green. Thus detection by the protanomalous must be by action of his other kind of cone, i.e., the anomalous cone. The exchange lights were presented upon a steady background of either red or green light, and the red intensity was adjusted to raise the exchange threshold as much as the green did. Then anomalous cones absorb light equally from these two backgrounds. The protanomalous pigment curve has the shape expected of a visual pigment with peak at about 550 nm. The deuteranomalous pigment has its peak at about 555 nm. F.R.L.

**A74-11917** **Isolation of a third chromatic mechanism in the protanomalous observer.** T. P. Piantanida and H. G. Sperling (Texas, University, Houston, Tex.). *Vision Research*, vol. 13, Nov. 1973, p. 2033-2047. 27 refs. Grant No. NIH-EY-00381-06.

The anomalous chromatic mechanism of simple protanomalous trichromats was found by the technique of increment thresholds. Protanomalous trichromats possess as their chromatic mechanism of long wavelength sensitivity one whose spectral sensitivity curve closely resembles that of erythrolabe. Its sensitivity peak is displaced from the normal 575 nm to approximately 545 nm. Neither the erythrolabe measured in normal trichromats, nor the anomalous mechanism of the protanomalous trichromats had a spectral sensitivity curve described by the Dartnall nomogram. The background found most effective in isolating the anomalous mechanism was one whose composition included a sufficient intensity of violet light to reduce the relative sensitivity of the blue cone photopigment. F.R.L.

**A74-11918** **The influence of subthreshold inducing fields on the detection of discs - An empirical test of the element contribution hypothesis.** G. A. Gelade and R. L. Beurle (Nottingham University, Nottingham, England). *Vision Research*, vol. 13, Nov. 1973, p. 2065-2078. 19 refs. Research sponsored by the Signals Research and Development Establishment.

Detection threshold for disk stimuli presented alone are compared with thresholds measured in the presence of subthreshold disk and annular stimuli. Regions of both positive and negative weighting are observed in which the presence of subthreshold stimulus respectively facilitates and inhibits detection. The results show that spatial integration in the visual system cannot be represented by a single weighting function, and suggest that detection threshold may be mediated by a system of size-tuned units acting in parallel. F.R.L.

**A74-11919** **A note on the neural unit model for contrast phenomena.** S. S. Bergstrom (Uppsala, University, Uppsala, Sweden). *Vision Research*, vol. 13, Nov. 1973, p. 2087-2092. 10 refs. Research supported by the Swedish Council for Social Science Research.

Bekesy's modified 'neural unit' having two types of inhibition, a Mach type and a Hering type, was tested as to its ability to predict

the appearance of two luminance gradients in space. The hypothesis was that the elimination of the Hering-type of inhibition near luminance steps would be sufficient to explain the absence of a brightness paradox in one of the gradients. The model was able, however, to predict the different appearances of the two gradients with no change at all of the parameters of the neural unit. F.R.L.

**A74-11920** **Orientation and spatial frequency channels in peripheral vision.** C. R. Sharpe and D. J. Tolhurst. *Vision Research,* vol. 13, Nov. 1973, p. 2103-2112. 24 refs.

The technique of spatial adaptation is used to demonstrate the existence of channels responsive to only limited ranges of spatial frequency and orientation in the periphery of the visual field. These channels are qualitatively similar to those found in the fovea. The effects of temporal modulation on the properties of these channels are studied. Unlike the fovea, peripheral channels responsive to moving stimuli may be more selective as to the orientation of stimulus that will excite them than are peripheral channels responding to stationary stimuli. F.R.L.

**A74-11921 *** **Spatial frequency doubling - Retinal or central.** W. Richards and T. B. Felton (MIT, Cambridge, Mass.). *Vision Research,* vol. 13, Nov. 1973, p. 2129-2137. 10 refs. NASA-supported research; Contract No. F44620-69-C-0108; Grant No. NIH-5-T01-GM-01064-01.

When a wide field is sinusoidally modulated both in space and in time, the spatial frequency of the pattern will appear doubled at high rates of modulation. Kelly (1966) proposed that this illusion is due to temporal integration of the nonlinear brightness response of the visual system. The anatomical locus of this temporal integrator is uncertain, and could be subcortical. Results indicate that spatial frequency doubling follows binocular disparity detection and is thus a cortical phenomenon. F.R.L.

**A74-11922** **Adapted and unadapted spatial frequency channels in human vision.** R. V. Lange (Brandeis University, Waltham, Mass.), C. Sigel (Pennsylvania, University, Philadelphia, Pa.), and S. Stecher (Lehigh University, Bethlehem, Pa.). *Vision Research,* vol. 13, Nov. 1973, p. 2139-2143. 8 refs. Grant No. NIH-RO1-EY-00023.

The range over which luminance modulation of two spatial frequencies contribute additively to grating detection is narrow around 13.3 cycle/deg even under conditions of high adaptability to this frequency. Thus, adaptation does not broaden this range into that observed for threshold elevation due to adaptation. It appears that the narrow width for additive influence persists, whether or not the visual system is adapted to a high contrast grating, and that high contrast adaptation does not account for the much wider frequency response characteristic observed by Blakemore and Campbell (1969). F.R.L.

**A74-11923** **Failure of Donders' Law during smooth pursuit eye movements.** G. Westheimer and S. P. McKee (California, University, Berkeley, Calif.). *Vision Research,* vol. 13, Nov. 1973, p. 2145-2153. 15 refs. Grants No. NIH-EY-00220; No. NIH-EY-00592.

Donders' Law states that the orientation around the fixation axis is always the same no matter what movement preceded the arrival of the eye in a given fixation position. Data are presented which show that Donders' Law does not hold for the pursuit system. When an eye is tracking through a given position by a smooth movement it occupies that position with a different cyclotorsional orientation than if it steadily fixates that position. Torsional differences between these two conditions are found for most tracking directions; they occasionally exceed 2 deg, and are not a function of target or eye velocity. Taken together with electrophysiological evidence, and with subjective observations that smooth eye movements, unlike saccades, are not compensated for in space perception, the findings point to significant differences in neural substrates of smooth tracking and saccadic eye movements. F.R.L.

**A74-11924 *** **Small step tracking - Implications for the oculomotor 'dead zone.'** D. Wyman and R. M. Steinman (Maryland, University, College Park, Md.). *Vision Research,* vol. 13, Nov. 1973, p. 2165-2172. 10 refs. Grants No. NsG-398; No. NIH-325.

Recently Timberlake, Wyman, Skavenski, and Steinman (1972) concluded in a study of the oculomotor error signal in the fovea that 'the oculomotor dead zone is surely smaller than 10 min and may even be less than 5 min (smaller than the 0.25 to 0.5 deg dead zone reported by Rashbass (1961) with similar stimulus conditions).' The Timberlake et al. speculation is confirmed by demonstrating that the fixating eye consistently and accurately corrects target displacements as small as 3.4 min. The contact lens optical lever technique was used to study the manner in which the oculomotor system responds to small step displacements of the fixation target. Subjects did, without prior practice, use saccades to correct step displacements of the fixation target just as they correct small position errors during maintained fixation. F.R.L.

**A74-11951** **Carbon monoxide as a hazard in aviation.** L. Howlett (Department of National Defence, Toronto, Canada) and R. J. Shephard (Toronto, University, Toronto, Canada). *Journal of Occupational Medicine,* vol. 15, Nov. 1973, p. 874-877. 60 refs. Research supported by the Department of Health of Ontario.

The susceptibility of aviation personnel to carbon monoxide poisoning is compared with that of some groups of the general population in a review of the occupational hazards due to the presence of carbon monoxide in the aviation environment. Community air pollution, local vehicular traffic, service vehicles, passive smoking, aircraft exhaust, pyrolysis, gasoline-powered generators, compressed gas, and firearms are considered as sources of carbon dioxide exposure. The pathology of carbon dioxide poisoning is outlined. It is concluded that taxi drivers and baggage handlers may be exposed to very high carbon monoxide concentrations but that the hazards are greater for aircrew members because of synergistic stresses and harsh task demands, even though they are exposed to lower carbon dioxide concentrations. It is suggested that exposures should not exceed 40 ppm for one hour, or 15 ppm for eight hours. V.Z.

**A74-12023** **Image-detector model and parameters of the human visual system.** A. D. Schnitzler (Institute for Defense Analyses, Arlington, Va.). *Optical Society of America, Journal,* vol. 63, Nov. 1973, p. 1357-1368. 20 refs.

An image-detector model of the visual system is described. Analysis of detection-probability data combined with signal-to-noise analysis of contrast-sensitivity data yield the fundamental visual-system parameters required to predict image-detection performance. The results for background luminances ranging from .001 to 100 millilamberts include the values of the threshold detection criterion or signal-to-noise ratio, the response time, the effective responsive quantum efficiency, the effective angular width of the point spread function, and the effective angular width of the maximum photoreceptor field belonging to the minimum-bandwidth spatial filter. Excellent agreement between theoretical curves and experimental data is shown. (Author)

**A74-12024** **Target-synthesized optical apertures.** N. H. Farhat (RCA Advanced Technology Laboratories, Camden, N.J.; Pennsylvania, University, Philadelphia, Pa.), D. G. Herzog, R. J. Tarzaiski, and H. M. Weiskittel (RCA Advanced Technology Laboratories, Camden, N.J.). *Optical Society of America, Journal,* vol. 63, Nov. 1973, p. 1403-1411. 11 refs.

Monitoring the Doppler history of an elementary target, such as a line scatterer traversing a coherent illuminating beam, and electro-optical processing of this Doppler information, permits reconstruction of a visible image of the line scatterer. A tutorial two-dimensional analysis assuming a line scatterer is presented in conjunction with a confirming optical experiment. These show how a single homodyne or heterodyne receiver suffices to retrieve those features of an extended object that lie parallel to its direction of motion across the beam. The possibility of long-range imaging by use

of target-synthesized apertures, especially at microwave frequencies, is also discussed on the basis of the results of this paper. (Author)

**A74-12026 Tachistoscopic detection as a function of varying degrees of physical exercise.** B. Goldwater and G. Zirul (Victoria, University, Victoria, British Columbia, Canada). *Perceptual and Motor Skills,* vol. 37, Oct. 1973, p. 399-402. 15 refs.

Stimuli from a Kodak Carousel twin-projector tachistoscope were given in a flat black projection tunnel to a group of 50 young male subjects who were performing physical exercises with different activity levels. The effect of variations in activity levels during various physical tasks on the sensory sensitivity of the subjects was assessed and was found to support the inverted-U hypothesis. V.Z.

**A74-12027 Some factors affecting magnitude of the Mueller-Lyer illusion.** P. C. Ebert and R. H. Pollack (Georgia, University, Athens, Ga.). *Perceptual and Motor Skills,* vol. 37, Oct. 1973, p. 433, 434. 7 refs.

Lightness contrast, tachistoscopic duration, and fundus pigmentation have been found to be critical factors determining the magnitude of the Mueller-Lyer illusion. Figures produced by marked lightness contrast evidence a gradual rise in illusion size with prolonged viewing, while the reverse is true for a figure produced by minimal contrast. (Author)

**A74-12028 Monitoring Army radio-communications networks at high altitude.** R. L. Cahoon (U.S. Army, Research Institute of Environmental Medicine, Natick, Mass.). *Perceptual and Motor Skills,* vol. 37, Oct. 1973, p. 471-476. 7 refs.

Two experiments were conducted to determine the effects of high-altitude atmospheres on the performance of a simulated Army radio-communication task. Subjects monitored two-hour tapes of simulated radio traffic at four different altitudes (sea level, 13,000 ft, 15,000 ft, and 17,000 ft). The results of one experiment indicated a significant drop in performance above 13,000 ft altitude. However, the other experiment, using highly motivated, radio trained subjects showed no performance decrements up to 17,000 ft. The data suggest that high motivation and training can compensate for altitude stress on monitoring tasks of relatively short duration. (Author)

**A74-12029 Effects on performance of high and low energy-expenditure during sleep deprivation.** W. B. Webb and H. W. Agnew, Jr. (Florida, University, Gainesville, Fla.). *Perceptual and Motor Skills,* vol. 37, Oct. 1973, p. 511-514. 6 refs. Contract No. N00014-70-C-0350.

Eight subjects were sleep deprived for two nights, using two different deprivation conditions. In the bed-rest condition subjects rested in bed while being sleep deprived. In the exercise condition subjects remained active and exercised for 15 min on an exercise bicycle every other hour. Performance measures were obtained before, during, and after sleep deprivation. The two conditions did not differentially affect sleep during recovery nor did they have differential effects on performance during deprivation. From these results it is inferred that in operational settings it is unlikely that performance decrements during sleep deprivation can be offset by having personnel reduce their activity level. (Author)

**A74-12030 Visual feedback, distribution of practice, and intermanual transfer of prism aftereffects.** M. M. Cohen (U.S. Naval Material Command, Naval Air Development Center, Warminster, Pa.). *Perceptual and Motor Skills,* vol. 37, Oct. 1973, p. 599-609. 20 refs.

Experiments were carried out to test the hypothesis that intermanual transfer of prism aftereffects depends on both the type of visual feedback provided to the observer and the distribution of practice during the antecedent prism-wearing session. Subjects of a group of eight reached for a target viewed through prisms at rates of 3, 6, 12, 24, and 48 times per minute after viewing the reaching hand only on completion of each trial. Measures of coordination were taken before and after exposure, using shifts in coordination as measures of aftereffects. The magnitude of intermanual transfer decreased significantly with increasing rates of responding. On the other hand, the results were inconclusive when a second group of nine subjects responded to trials at rates of 6, 12, and 24 times per minute, viewing the reaching hand through prisms at all times. V.Z.

**A74-12031 Effects of local and general fatigue on static balance.** J. K. Nelson (Louisiana State University, Baton Rouge, La.) and B. L. Johnson (Northeast Louisiana University, Monroe, La.). *Perceptual and Motor Skills,* vol. 37, Oct. 1973, p. 615-618. 9 refs.

A static balance test was given to 120 college men and women before and after 2 exercise bouts. In one type of exercise heel raises were used to induce local muscular fatigue. Squat thrusts were employed as the general body fatiguing exercise. Both general body-fatigue exercise and local-fatigue exercise impaired static balance performance. However, the general body-fatigue resulted in significantly greater decrement in static balance scores than local fatigue. There was no significant difference in the amount of impairment between men and women. (Author)

**A74-12032 Temne-Arunta hand/eye dominance and susceptibility to geometric illusions.** J. L. M. Dawson (University of Hong Kong, Hong Kong). *Perceptual and Motor Skills,* vol. 37, Oct. 1973, p. 659-667. 19 refs.

The effects of mixed hand/eye dominance on geometric illusion susceptibility were investigated in 149 male skilled mine workers from the Temne jungle environment in Sierra Leone. A Dawson-modified short form of the Witkin et al. (1962) embedded figures test was applied to determine the cognitive style of the subjects. An Australian Aboriginal Arunta male sample of 30 subjects with Primary VI/Form I secondary education was also used to test the 'Carpentered-World' and 'Horizontal-Vertical' hypotheses. Further studies with effective controls of individual spatial articulation and eye movements are suggested for determining with more precision the variables involved in such experiments. V.Z.

**A74-12151 Visual perception of biological motion and a model for its analysis.** G. Johansson (Uppsala, Universitet, Uppsala, Sweden). *Perception and Psychophysics,* vol. 14, Oct. 1973, p. 201-211. 17 refs. Research supported by the Swedish Council for Social Science Research.

Report of the first phase of a research program on visual perception of motion patterns characteristic of living organisms in locomotion. Such motion patterns in animals and men are termed here as biological motion. In everyday perceptions, the visual information from biological motion and from the corresponding figurative contour patterns (the shape of the body) are intermingled. A method for studying information from the motion pattern per se without interference with the form aspect was devised. In short, the motion of the living body was represented by a few bright spots describing the motions of the main joints. It is found that 10 to 12 such elements in adequate motion combinations in proximal stimulus evoke a compelling impression of human walking, running, dancing, etc. The kinetic-geometric model for visual vector analysis originally developed in the study of perception of motion combinations of the mechanical type was applied to these biological motion patterns. (Author)

**A74-12152 Selective encoding from multielement visual displays.** R. L. Colegate, J. E. Hoffman, and C. W. Eriksen (Illinois, University, Champaign, Ill.). *Perception and Psychophysics,* vol. 14,

Oct. 1973, p. 217-224. 15 refs. Grant No. PHS-MH-1206.

When a multiletter display is preceded by a bar designating one of the letters for report, reaction time (RT) to voice the indicated letter decreases. Previous research had indicated that the efficiency of this selective mechanism decreases as the number of display elements increases. Two experiments were conducted to determine whether the effect of display size could be eliminated when the indicator precedes the display at long intervals. Results indicated that the display size effect was maintained. The results could not be attributed to eye movements, but were interpreted in terms of a central encoding mechanism that is limited in its precision of localization and exclusion. (Author)

**A74-12153 The effects of concentrated and distributed attention on peripheral acuity.** J. Beck and B. Ambler (Oregon, University, Eugene, Ore.). *Perception and Psychophysics*, vol. 14, Oct. 1973, p. 225-230. 8 refs. NSF Grants No. GB-24884; No. GJ-32258X; Contract No. F44620-67-C-0099.

Two experiments studied the peripheral discriminability of a target differing in its line slope (a tilted T) and in its line arrangement (an L) when presented in briefly flashed displays of upright Ts. The results showed that: (1) an L and a tilted T were equal in discriminability when attention was focused or concentrated on one display position, (2) the discriminability of an L decreased while the discriminability of a tilted T was not statistically significantly affected as the number of display positions that attention needed to be paid to increased, and (3) the reaction time to find a disparate tilted T was less than to find a disparate L. The results are interpreted as supporting the hypothesis that, under distributed attention in peripheral vision, the visual system is more sensitive to differences in line slope than to differences in line arrangement. The results are discussed in connection with hypotheses of how selective attention affects the discriminability of a target. (Author)

**A74-12154 On the degree of attention and capacity limitations in visual processing.** R. M. Shiffrin, G. T. Gardner, and D. H. Allmeyer (Rockefeller University, New York, N.Y.). *Perception and Psychophysics*, vol. 14, Oct. 1973, p. 231-236. 19 refs. Grant No. PHS-12717-06.

The ability to detect simple types of visual information from various locations in the visual field was examined in two experiments. In both, the four locations containing the information to be detected were presented either simultaneously or sequentially, with the presentation time per location identical for both conditions. Limitations of capacity and attentional control of perceptual processing would predict sequential presentation to be superior to simultaneous presentation, since, in the former case, attention need not be shared among four locations. The results showed equal detection performance for both conditions. Thus, spatial attention was not present during detection of horizontal and vertical dot pairs. Observer differences (probably due to strategies) make the same conclusion more difficult to draw for single-dot detection. Similar findings and conclusions were reported by Shiffrin and Gardner (1972) in studies utilizing alphabetic characters. (Author)

**A74-12155 The effects of tilted outline frames and intersecting line patterns on judgments of vertical.** P. M. Wenderoth (Sydney, University, Sydney, Australia). *Perception and Psychophysics*, vol. 14, Oct. 1973, p. 242-248. 23 refs. Research supported by the University of Sydney.

The angular function of the rod-and-frame illusion has been attributed to the effects of the major, virtual axes of the frame. Only one of two possible interpretations of this hypothesis adequately accounted for vertical settings made in the presence of outline frames and intersecting line patterns tilted between vertical and 45 deg. The results obtained with intersecting line patterns did not appear to be explicable by torsional effects or the simple addition of tilted-line illusions. (Author)

**A74-12156 Induction-, test-, and comparison-figure interactions under illusion and figural aftereffect conditions.** R. B. Howard, G. W. Evans, and J. K. McDonald (Colgate University, Hamilton, N.Y.). *Perception and Psychophysics*, vol. 14, Oct. 1973, p. 249-254. 18 refs. Research supported by the Colgate Research Council and Sloan Foundation.

Ganz (1966) has argued that an induction figure will displace a test figure placed near it under both illusion and figural aftereffect conditions. Experimental data are presented which show that most of the illusion produced by the figures studied by Ganz results from an interaction between the comparison and induction figures, as well as data which suggest that both the test and comparison figures interact with the induction figure under figural aftereffect conditions. Although the induction-test figure interactions do not contradict Ganz's model, the induction-comparison figure interactions cannot be explained by it. The data also suggest that researchers should be extremely cautious in drawing conclusions about the processes underlying illusions and figural aftereffects unless they are confident that there is no interaction between the induction and comparison figures. (Author)

**A74-12157 Eye-movement patterns in selective listening tasks of focused attention.** D. Gopher (Tel Aviv University, Tel Aviv, Israel). *Perception and Psychophysics*, vol. 14, Oct. 1973, p. 259-264. 16 refs.

Three experiments are described in which eye movements (Ems) were recorded in conjunction with either monaural or dichotic tasks of focused attention. Two main effects were observed in the Ems records: (1) listening to auditory messages reduced the occurrence of spontaneous Ems, and (2) selective monitoring of one ear in the dichotic task was accompanied by a consistent pattern of directional Ems characterized by big saccades and long changes of eye fixation in the direction of the relevant ear. The pattern of Ems is affected by the following variables: the presentation rate of the auditory information, the frequency of demands to switch orientation between the ears, and the competition of the irrelevant channel in the dichotic task. It is suggested that the eye-movement mechanism is used in selective listening tasks as a general orientation indicator, when the adoption or maintenance of a certain selective set is difficult and demanding of effort. The Ems response is part of a general orientation pattern, although its usual function is in the field of visual perception. (Author)

**A74-12158 * Vertex potentials evoked during auditory signal detection - Relation to decision criteria.** K. C. Squires, S. A. Hillyard, and P. H. Lindsay (California, University, La Jolla, Calif.). *Perception and Psychophysics*, vol. 14, Oct. 1973, p. 265-272. 26 refs. Grants No. NIH-NS-07454; No. NGR-05-009-083.

Vertex potentials were recorded from eight subjects performing in an auditory threshold detection task with rating scale responses. The amplitudes and latencies of both the N1 and the late positive (P3) components were found to vary systematically with the criterion level of the decision. These changes in the waveshape of the N1 component were comparable to those produced by varying the signal intensity in a passive condition, but the late positive component in the active task was not similarly related to the passively evoked P2 component. It was suggested that the N1 and P3 components represent distinctive aspects of the decision process, with N1 signifying the quantity of signal information received and P3 reflecting the certainty of the decision based upon that information. (Author)

**A74-12159 The effect of texture on the magnitude of simultaneous brightness contrast.** S. Coren (British Columbia, University, Vancouver, Canada) and E. M. Brussell (York University, Toronto, Canada). *Perception and Psychophysics*, vol. 14, Oct. 1973, p. 277-279. 18 refs.

The magnitude of simultaneous brightness contrast was mea-

sured while the coarseness of the textural overlay was varied. Results from ten subjects indicate that as the size of elements in the texture increases, the amount of obtained contrast decreases. An interpretation of these results in terms of the spread of lateral inhibitory effects is offered. (Author)

**A74-12160** **The influence of texture on judgments of slant and relative distance in a picture with suggested depth.** C. V. Newman, E. A. Whinham, and A. W. MacRae (Birmingham, University, Birmingham, England). *Perception and Psychophysics,* vol. 14, Oct. 1973, p. 280-284. 14 refs.

**A74-12161** **Metacontrast and brightness discrimination.** I. H. Bernstein, J. D. Proctor, R. W. Proctor (Texas, University, Arlington, Tex.), and D. L. Schurman (Emory University, Atlanta, Ga.). *Perception and Psychophysics,* vol. 14, Oct. 1973, p. 293-297. 12 refs. Research supported by the Liberal Arts Organized Research Funds, University of Texas, and Genco Abbandando Foundation.

An attempt was made to obtain U-shaped masking functions in two metacontrast experiments. Trained subjects judged whether a square test stimulus (TS) was bright or dim. The TS was presented alone or in conjunction with an adjacent pair of square masking stimuli (MS) whose energy equaled the bright TS. The stimulus onset asynchronies (SOA) ranged from 0 to 125 msec. The task minimized the role of apparent movement cues as a reliable basis for judgment. Similar studies have employed TS plus MS vs MS alone as the alternatives, allowing apparent movement to be a cue. Brightness accuracy was a U-shaped function of SOA. This finding is consistent with neural-net models (Weisstein, 1968). However, analysis of subjects' response bias suggested an alternative explanation involving the MS as a comparison stimulus at short SOA. It was concluded that U-shaped masking functions are also consistent with theories based upon independent component processes - e.g., Schurman and Eriksen (1970) and Uttal (1970). (Author)

**A74-12162** **Range estimates of distant visual stimuli.** E. Galanter and P. Galanter (Columbia University, New York, N.Y.). *Perception and Psychophysics,* vol. 14, Oct. 1973, p. 301-306. 15 refs. Navy-supported research.

Observers made magnitude estimations of the range of visual targets located at physical distances from a few hundred yards or less to more than 5 miles. The targets were at different elevations in different experiments so that observer's gaze varied from 0 to 90 deg. The targets were presented against the empty sky or against water. The observers were stationary in most experiments, but were in motion in one. Results show that the psychophysical functions are power functions whose exponents range from about 1.25 to 0.8, depending on the angle of the target above the horizontal. Background texture or observer motion had no effect. (Author)

**A74-12163** **Temporal summation at the warmth threshold.** J. C. Stevens, W. C. Okulicz, and L. E. Marks (John B. Pierce Foundation Laboratory; Yale University, New Haven, Conn.). *Perception and Psychophysics,* vol. 14, Oct. 1973, p. 307-312. 19 refs. Grant No. PHS-ES-00354-05.

Threshold levels for warmth aroused by infrared irradiation were measured in six subjects at durations between 0.05 and 10 sec. Beyond a critical duration of about a second, the threshold does not depend on duration. Below critical duration time t trades for irradiance phi according to the formula phi = kt to the minus 0.82 power. That these properties do not depend much on areal extent of stimulation was demonstrated by a study that compared temporal summation for two different areas of the same subject's skin. Individual differences in apparent absolute sensitivity were explored under the rubric of the theory of signal detection. (Author)

**A74-12164** **Attention, brightness contrast, and assimilation - The influence of relative area.** E. M. Brussell (New School for Social Research, New York, N.Y.). *Perception and Psychophysics,* vol. 14, Oct. 1973, p. 325-333. 18 refs. Grant No. NIH-16327.

A model of information transmission in the visual system which describes the effect of attention on apparent brightness is examined. This model states in part that the luminance of the portion of the visual field which captures the attention is overweighted in arriving at an overall average luminance level across the visual field. As this average must be computed with respect to both luminance and relative area, it is hypothesized that increasing the relative area of the portion of the visual field that captures the attention will result in a greater effect on the apparent brightness of all parts of the visual field. Two predictions, which involve the effect of relative area on apparent brightness, are experimentally tested and confirmed. (Author)

**A74-12165** **Use of Markov-encoded sequential information in numerical signal detection.** L. M. Ward (Rutgers University, New Brunswick, N.J.). *Perception and Psychophysics,* vol. 14, Oct. 1973, p. 337-342. 13 refs. Research supported by the Rutgers Research Council.

Twelve subjects made binary decisions with feedback on numbers from one to two normal distributions with equal variances and unequal means. Sequences of distribution choices corresponded to first-order two-state Markov processes. First-order sequential response dependences tended to mirror the first-order stimulus dependences. Violations of a fixed cutoff point decision rule were concentrated in the region of the average critical point, with a bandwidth of about 1/2 sigma, in which violations were strikingly more frequent than would be expected if they had occurred randomly. These results imply that in this task subjects are using a criterion-band decision rule instead of a fixed cutoff point rule, and that they are basing decisions in the region of the criterion band on information extracted from the sequence of decisions presented to them. The average bandwidth is generally different from the optimum bandwidth used by an ideal observer in combining the two sources of information. (Author)

**A74-12166** **The apparent length of rotating arcs under conditions of dark adaptation.** A. J. Marshall (Western Australia, University, Nedlands, Australia) and G. Stanley (Melbourne, University, Melbourne, Australia). *Perception and Psychophysics,* vol. 14, Oct. 1973, p. 349-352. 14 refs. Australian Research Grants Committee Grant No. A67/16441.

The apparent contraction of a rotating light arc occurred during the first 20 min, but not after 25 min, of dark adaptation. Estimates of length obtained after 25 min were affected by the level of luminance of the arc but not by its speed of rotation, by dark gaps in the arc, or by instructions to estimate its length in terms of a brighter region. There was no tendency for a rotating dark arc to appear shorter at any stage of adaptation. (Author)

**A74-12167** **The nature of size scaling in the Ponzo and related illusions.** B. Gillam (New York, State University, New York, N.Y.). *Perception and Psychophysics,* vol. 14, Oct. 1973, p. 353-357. 13 refs. Grant No. PHS-5-R01-EY-00391.

The failure of previous investigators to obtain a Ponzo illusion when each test line is rotated 90 deg from its conventional placement has been interpreted as a refutation of constancy scaling theory. It was proposed that, instead, these results might be due to a failure of linear perspective to elicit foreshortening scaling, and vice versa, since the two types of perspective have different functions. This hypothesis was tested and confirmed. (Author)

**A74-12168** **The time it takes to make veridical size and distance judgments.** K. D. Broota (Delhi, University, New Delhi, India) and W. Epstein (Wisconsin, University, Madison, Wis.). *Perception and Psychophysics,* vol. 14, Oct. 1973, p. 358-364. 8 refs. Research supported by the Ford Foundation; Grant No. PHS-MH-16390.

Two experiments measuring the time it takes to make veridical size judgments under normal (unreduced) conditions of viewing showed that RT tended to increase with increases in viewing distance between 122 and 305 cm, even for targets subtending the same visual angle at all distances. Two experiments measuring the time it takes to judge distance under the same conditions did not reveal any difference in RT as a function of the extent-of-distance judged. Established accounts of size perception do not suggest an explanation of these findings. (Author)

**A74-12169** **Acoustic confusion of digits in memory and recognition.** B. J. T. Morgan, S. M. Chambers, and J. Morton (Medical Research Council, Cambridge, England). *Perception and Psychophysics,* vol. 14, Oct. 1973, p. 375-383. 45 refs.

The mechanism responsible for acoustic confusion of digits was studied in 29 experiments involving the recall and recognition of spoken digits. Analysis of errors indicates that digits are not equally memorable or recognizable and that confusions are systematic. The pattern of confusions differs for the memory and recognition tasks. The practical significance of the findings is that the use of different random digit strings in memory experiments is liable to lead to systematic experimental error. T.M.

**A74-12170** **Orientation and spatial frequency effects on linear afterimages: The retinal reference for selectivity - A supplementary report.** N. J. Wade (Dundee, University, Dundee, Scotland). *Perception and Psychophysics,* vol. 14, Oct. 1973, p. 384-386. 12 refs. Research supported by the Science Research Council.

**A74-12171** **The effect of fixation point on the appearance of rectilinearity.** L. S. Prytulak (Western Ontario, University, London, Ontario, Canada). *Perception and Psychophysics,* vol. 14, Oct. 1973, p. 387-393. National Research Council of Canada Grant No. APA-390.

Data from two experiments indicate that (a) within 3.5 deg visual angle of the fixation point, an eccentrically fixated line and dot appear rectilinear when they are objectively convex toward the fixation point; (b) beyond 3.5 deg, they appear rectilinear when they are objectively concave; (c) the latter effect is not an artifact of the use of stationary fixation points; and (d) the addition of an extraneous line to the stimulus line so as to form a 90-deg angle acts as if to reduce the apparent size of the angle, but does not alter fixation point effects. The data were interpreted as supporting (a) the hypothesis that the stimulus line was more sensitive to illusory distortion than the dot, and (b) the ID (increasing-decreasing) model of the visual field - an inner area of increasing concentric contraction (stimuli appear to lie nearer the fixation point to a degree which increases with distance from the fixation point) is bounded by an outer area of decreasing concentric contraction. (Author)

**A74-12324** **Man in isolation and confinement.** Edited by J. E. Rasmussen (Battelle Human Affairs Research Centers, Seattle, Wash.). Chicago, Aldine Publishing Co., 1973. 339 p. $9.50.

Behavioral and physiological effects of prolonged sensory and perceptual deprivation are discussed together with temporal isolation, activity rhythms, and time estimation. Other subjects explored include effects of geographic and social isolation in natural settings, individual behavior in confined or isolated groups, the indirect observation of groups under confinement and/or isolation, the naturalistic observations of isolated experimental groups in field settings, and laboratory studies regarding the miniworld of isolation. An ecological approach to the functioning of socially isolated groups is also considered along with strategies of research on groups in isolation, and the taxonomy of man in enclosed space. G.R.

**A74-12325** **Behavioral and physiological effects of prolonged sensory and perceptual deprivation - A review.** J. P. Zubek (Manitoba, University, Winnipeg, Manitoba, Canada). In: Man in isolation and confinement. Chicago, Aldine Publishing Co., 1973, p. 8-83. 228 refs. Defense Research Board of Canada Grant No. 9425-08; National Research Council of Canada Grant No. APA-290.

Experimental procedures are considered, giving attention to a differentiation between methods involving sensory deprivation (SD) and approaches concerned with perceptual deprivation (PD). In the SD condition, efforts are made to reduce sensory stimulation to as low a level as possible. In the PD condition, on the other hand, an attempt is made to reduce the patterning and meaningful organization of sensory stimulation while maintaining its level near normal. Subjective phenomena are discussed together with cognitive measures, the susceptibility to persuasion or influence, aspects of stimulus-seeking behavior, sensory and perceptual-motor effects, physiological effects, biochemical effects, questions of isolation endurance, approaches for counteracting the effects of SD and PD, and the relative effects of confinement, social isolation, and sensory restriction. G.R.

**A74-12326** **Temporal isolation, activity rhythms, and time estimation.** P. Fraisse (Paris V, Université, Paris, France). In: Man in isolation and confinement. Chicago, Aldine Publishing Co., 1973, p. 84-97. 24 refs. Direction des Recherches et Moyens d'Essais Contracts No. 326-65; No. 540-66.

French cave studies are considered together with the sleep-wakefulness rhythm, the body temperature rhythm, questions regarding the evolution of vigilance and performance, the estimation of duration, the estimation of the length of a stay underground, and the estimation of long and short durations. It is attempted to study some consequences of the complete temporal isolation of subjects confined to caves or bunkers in the 'free-running' condition. In this condition, the subject is free to organize his life in his own way. G.R.

**A74-12327** **The indirect observation of groups under confinement and isolation.** P. D. Nelson (U.S. Navy, Bureau of Medicine and Surgery, Washington, D.C.). In: Man in isolation and confinement. Chicago, Aldine Publishing Co., 1973, p. 166-193. 54 refs.

Concepts of group formation are examined, giving attention to questions of planned vs accidental confinement and/or isolation and to aspects of group structure prior to confinement and/or isolation. Concepts of group environment are considered together with concepts of group behavior, group goal patterns, group structure, group culture, and group effectiveness criteria. Methods for the indirect assessment of groups are discussed, taking into account, the interview, the questionnaire, the diary, the organization record, and the site visit. G.R.

**A74-12328** **Naturalistic observations of isolated experimental groups in field settings.** R. W. Radloff (National Science Foundation, Washington, D.C.). In: Man in isolation and confinement. Chicago, Aldine Publishing Co., 1973, p. 194-216. 36 refs.

Questions of methodological orientation are considered together with conditions of saturation diving, psychological research on saturation diving, general characteristics of criteria and predictors,

and criteria components. Problems regarding the decision on the criteria are investigated, taking into account the task performance, the task predictors, questions of social interaction, emotional criteria, emotional predictors, deviation scores, reasons for heterogeneous measures, extensions and applications of the proposed approach, and automated data collection methods. G.R.

**A74-12329 The miniworld of isolation - Laboratory studies.** W. W. Haythorn (Florida State University, Tallahassee, Fla.). In: Man in isolation and confinement. Chicago, Aldine Publishing Co., 1973, p. 218-239. 39 refs.

Stresses of isolation are examined, taking into account stimulus reduction, confinement, social isolation, and interpersonal stress. Aspects of the performance in isolated groups are discussed together with questions of need satisfaction in isolated groups. The needs considered include physiological needs and needs for affection, belonging, love, approval, acceptance, and self-actualization. G.R.

**A74-12330 The taxonomy of man in enclosed space.** S. B. Sells. In: Man in isolation and confinement. Chicago, Aldine Publishing Co., 1973, p. 280-303. 55 refs.

The variables related to behavior in isolation are considered, giving attention to three sets of variables believed to account for major portions of variance. These represent the situation, the social system, and the individual personality. Ten situational dimensions that are believed to have significant implications for behavior in isolation are analyzed and the social system characteristics are considered, taking into account objectives, value systems, personnel composition, organization, technology, physical environment, and temporal characteristics. G.R.

**A74-12415 Local motion of the chest wall during passive and active expansion.** E. D'Angelo, S. Michelini, and G. Miserocchi (Ferrara, Università, Ferrara; Milano, Università, Milan, Italy). *Respiration Physiology*, vol. 19, Oct. 1973, p. 47-59. 13 refs. Research supported by the Consiglio Nazionale delle Ricerche.

Relative motion of various portions of the thorax vs pressure was studied during passive and active inflation in normal and eviscerated rabbits in supine and head-up postures with and without pneumothorax. Local specific distensibility of the thorax was nearly uniform in relaxed supine animals, was larger in the caudal portions, especially in normal animals, and was generally similar in animals with and without pneumothorax. The features of thoracic motions were consistent with the behavior of the vertical transpulmonary pressure gradients during active and passive expansion of the respiratory system. V.Z.

**A74-12416 A general theory of respiratory mechanics applied to forced expiration.** J. Clement, K. P. van de Woestijne, and J. Pardaens (Academisch Ziekenhuis St. Rafael, Louvain, Belgium). *Respiration Physiology*, vol. 19, Oct. 1973, p. 60-79. 22 refs. Research supported by the Fonds voor Geneeskundig Wetenschappelijk Onderzoek.

Theoretical study of the relation between expiratory flowrates, pleural pressure, and static lung recoil pressure in a respiratory system with a symmetrical and compliant bronchial tree. It is shown that a compliant tube traversed by a flow may be in a state of either stable or unstable equilibrium, depending on the relation between the three variables. V.Z.

**A74-12417 Responsiveness of breathing control centers to CO2 and neurogenic stimuli.** J. P. Farber and G. N. Bedell (Iowa, University, Iowa City, Iowa). *Respiration Physiology*, vol. 19, Oct. 1973, p. 88-95. 22 refs. Research supported by the Iowa Heart Association and NIH.

Ventilation due to neurogenic stimuli was measured in ten normal men during rapid changes in ventilation intensity at the onset and cessetion of exercises on a treadmill. A rebreathing technique was used to determine the ventilatory response to carbon dioxide. A wide range of responses to carbon dioxide was established in individual subjects, and their responses showed no detectable correlation to the neurogenic stimuli applied. These findings are interpreted as suggesting that a ventilatory response to carbon dioxide may not be indicative of the overall responsiveness of the breathing control centers. V.Z.

**A74-12418 Adrenergic blockade and the pulmonary vascular response to hypoxia.** A. B. Malik (Toronto, University, Toronto, Canada) and B. S. L. Kidd (Hospital for Sick Children, Toronto, Canada). *Respiration Physiology*, vol. 19, Oct. 1973, p. 96-106. 33 refs. Research supported by the Medical Research Council of Canada.

The role of adrenergic mechanisms in the mediation of pulmonary vascular responses to hypoxia was studied in anesthetized intact dogs. The effects of phenoxybenzamine (2.5 mg/kg) and propranolol (2.0 mg/kg) on the hypoxic response were determined after the stabilization of systemic and pulmonary hemodynamics. The findings indicate that a pulmonary vascular response to hypoxia in intact dogs is not under sympathetic control and that responses to hypoxia are local. V.Z.

**A74-12437 A biological constant examined - The blood pH (Une constante biologique remise en cause - Le pH sanguin).** P. Dejours. *La Recherche*, vol. 4, Nov. 1973, p. 1004-1006. 10 refs. In French.

In recent years physiologists have overturned various concepts concerning the pH of the blood by showing that normally the blood pH of animals varies with their temperature. This basic concept, capable of explaining many results obtained up to now, appears to be of primary interest for many reasons. It is shown that blood behaves as in a closed system, and the circulatory systems of the carp and the tortoise are evaluated. F.R.L.

**A74-12476 # Direction of involuntary eye shifts during eccentric fixation of a point target (Napravlennost' neproizvol'nykh skachkov glaz pri ekstsentrichnoi fiksatsii tochki).** V. A. Filin (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Meditsinskogo Priborostroeniia, Moscow, USSR) and S. P. Sidorov (Vrachebno-Fizkul'turnyi Dispanser, Moscow, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 59, Sept. 1973, p. 1341-1347. 15 refs. In Russian.

A photoelectric apparatus was used to study microscopic movements of the eyes in six adult human subjects during eccentric fixation of a neon-lamp target. It is shown that most of the involuntary eye shifts are oriented toward the direction of eye movement during fixation of a target to the left or right of the center of vision. The effect becomes more evident with increasing distance of lateral eye movement required for fixation of the target. Both the amplitude and frequency of involuntary eye movements increase with lateral movement of the eyes. The previous position of the eyes is shown to affect the direction of the involuntary shifts. If the eyes were held for a long period in an extreme left position and then were directed in a neutral position, the involuntary movements took place to the right of the fixation point. T.M.

**A74-12477 # Relationship between peripheral and central mechanisms of visual dark adaptation (O sootnoshenii perifericheskikh i tsentral'nykh mekhanizmov zritel'noi temnovoi adaptatsii).** V. I. Shostak and E. A. Obukhova (Voenno-Meditsinskaia Akademiia, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 59, Sept. 1973, p. 1355-1360. 29 refs. In Russian.

The evoked bioelectrical activity of the external geniculate body and the visual cortex in rabbits was studied during dark adaptation after disadapting illumination. The recording of the electrical activity

and the application of the disadapting and test flashes were carried out ipsi- and contralaterally in different combinations. A sharp depression of the amplitude of evoked potentials followed the disadapting illumination, with the recovery period being longer than 40 min. The presence of a strong correlation between the recovery dynamics of evoked responses from the retina and visual centers is interpreted as proof that changes in the evoked bioelectrical activity of visual centers after disadapting illumination are mainly caused by weakening of afferent impulsation from the peripheral afferent system due to a sharp drop in retinal sensitivity. T.M.

**A74-12478** # **Measurement of the duration of auditory perception (K izmereniiu dlitel'nosti slukhovogo oshchushcheniia).** S. N. Gol'dburt (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 59, Sept. 1973, p. 1361-1370. 25 refs. In Russian.

Experimental data on human capacity for resolution between loudness levels of two short tones in small intervals of time are used to plot curves showing the maximum and the decline in perceived loudness. A rise of the differential loudness threshold for short tones in short intervals is interpreted as evidence that the duration of maintained loudness is equivalent to the duration of perception. The general duration of perception is from 400 to more than 500 msec, while the peak perception interval lasts from 40 to 120 msec. The rate of decreasing perception is studied as a function of sound intensity (10, 30, and 70 dB above threshold) and duration (2 to 50 msec). T.M.

**A74-12479** # **Active hyperemia of skeletal muscles and biochemical indices of the sufficiency of blood supply (Rabochaia giperemiia skeletnykh myshts i biokhimicheskie pokazateli dostatochnosti krovosnabzheniia).** L. T. Lysenko and A. V. Trubetskoi (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 59, Sept. 1973, p. 1385-1392. 16 refs. In Russian.

Experiments with dogs show that after 20 min of skeletal muscle contraction without fatigue and under conditions of optimal blood supply, the muscle begins to utilize lactic acid. The functional and biochemical changes induced by the muscular work did not disappear immediately after termination of the work. Blood flow remained at an accelerated level for a further period of one minute, while the muscle oxygen uptake dropped sharply within 3 min but still remained about 10% above that of a resting muscle for a prolonged period. Glycolysis was the slowest in reverting to norm, with the consequence of continued lactic acid production after termination of work by the muscle. T.M.

**A74-12480** # **Analysis of mechanisms for self-regulation of rhythmic cardiac action (Analiz mekhanizmov samoreguliatsii ritmicheskoi deiatel'nosti serdtsa).** M. I. Iakovleva, A. G. Katrushenko, and V. V. Slautsitais (Akademiia Meditsinskikh Nauk SSSR, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 59, Sept. 1973, p. 1403-1409. 17 refs. In Russian.

A bioelectric feedback loop was employed in experiments with rabbits designed to study adaptive shifts in rhythmic cardiac action using a conditioned reflex to electrical stimulation. EKG signals were used to trigger electrical stimuli applied to the skin in an effort to reduce the heart rate. After repeated trials, a 20 to 30% reduction in heart rate could be stably maintained by the animals; the results are interpreted in terms of an adaptive mechanism that seeks to minimize biologically negative effects in rhythmic cardiac action. T.M.

**A74-12481** # **Changes in the volume of the blood flow from the liver in the presence of certain reflex and humoral effects on blood circulation (Izmeneniia ob'ema ottekaiushchei ot pecheni krovi pri nekotorykh reflektornykh i gumoral'nykh vozdeistviiakh na krovoobrashchenie).** I. P. Krichevskaia (Gosudarstvennyi Meditsinskii Institut, Alma-Ata, Kazakh SSR). *Fiziologicheskii Zhurnal SSSR,* vol. 59, Sept. 1973, p. 1422-1428. 21 refs. In Russian.

**A74-12482** # **Kinetics and mechanisms of initial distribution of water in the human organism after intravenous administration (Kinetika i mekhanizmy nachal'nogo raspredeleniia vody v organizme cheloveka posle vnutrivennogo vvedeniia).** M. I. Balonov, I. A. Likhtarev, and Iu. Ia. Bagrov (Ministerstvo Zdravookhraneniia SSSR, Institut Radiatsionnoi Gigieny, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 59, Sept. 1973, p. 1437-1442. 14 refs. In Russian.

**A74-12509 Labyrinthine control of inferior oblique motoneurons.** A. Berthoz (CNRS, Laboratoire de Physiologie du Travail; Conservatoire National des Arts et Métiers, Paris, France), R. Baker (Iowa, University, Oakdale, Iowa), and W. Precht (Max-Planck-Institut für Hirnforschung, Frankfurt am Main, West Germany). *Experimental Brain Research,* vol. 18, Oct. 26, 1973, p. 225-241. 38 refs.

Combined activation of both labyrinths during sinusoidal tilting produced a velocity-related discharge in ten inferior oblique motoneurons of an alert cat. The cat was placed on a rotating table so that the head of the animal could be rotated about an anterio-posterior axis during sinusoidal angular rotation. The discharges showed a slow increase and rapid depressions which were similar to those during the slow phase of nistagmus. Most discharges occurred when the recorded side was in a tilted-up position but some saccades also occurred in side-down positions. Neuron responses in both tilted positions are interpreted in terms of a saccadic activity similar to the quick phase of nystagmus. The tonic activity of the ten motoneurons increased and discharges reached a peak during sinusoidal tilt, following hemilabyrinthectomy. V.Z.

**A74-12510 Responses in the spino-reticulo-cerebellar pathway to stimulation of cutaneous mechanoreceptors.** I. Rosen and P. Scheid (New York, State University, Buffalo, N.Y.). *Experimental Brain Research,* vol. 18, Oct. 26, 1973, p. 268-278. 19 refs. Grant No. NIH-ROI-NB-08221-01.

**A74-12511 Interactions between orientations in human vision.** R. H. S. Carpenter and C. Blakemore (Cambridge University, Cambridge, England). *Experimental Brain Research,* vol. 18, Oct. 26, 1973, p. 287-303. 32 refs. Medical Research Council Grant No. G-970/807/B.

Single lines cause changes in the apparent orientation of nearby lines of somewhat different orientation: acute angles are perceptually expanded while obtuse angles apparently contract. This phenomenon is measured by a matching technique and evidence is presented that it is due to recurrent, inhibitory interactions among orientation selective neural channels. In particular, a third line added to an angle figure can have a disinhibiting effect on the orientational distortion. Orientation selective channels maximally sensitive to different orientations may have different distributions of inhibitory input in the orientation domain. The results are interpreted in terms of the organization of neurones in the visual cortex. Each cell may receive a crude orientation selectivity from its direct input, and be inhibited, over an even broader range of orientation, by neurones in the same column and adjacent ones. (Author)

**A74-12512 Dependence of surround effects on receptive field center illumination in cat retinal ganglion cells.** J. Krüger and B. Fischer (Neurologische Universitätsklinik, Freiburg im Breisgau, West Germany). *Experimental Brain Research,* vol. 18, Oct. 26, 1973, p. 304-315. 26 refs. Research supported by the Stiftung Volkswagenwerk and Deutsche Forschungsgemeinschaft.

**A74-12513 Strong periphery effect in cat retinal ganglion cells - Excitatory responses in ON- and OFF-center neurones to single grid displacements.** J. Krüger and B. Fischer (Neurologische Universitätsklinik, Freiburg im Breisgau, West Germany). *Experimental Brain Research,* vol. 18, Oct. 26, 1973, p. 316-318. 10 refs.

**A74-12581 * #** **Space Shuttle EVA requirements.** R. L. Cox, R. J. Copeland, and P. W. Wood, Jr. (LTV Aerospace Corp., Vought Systems Div., Dallas, Tex.). *American Institute of Aeronautics and Astronautics, Crew Equipment Systems Conference, Las Vegas, Nev., Nov. 7-9, 1973, Paper 73-1332.* 9 p. 9 refs. Members, $1.50; nonmembers, $2.00. Contract No. NAS9-12507.

Description of a Space Shuttle mission and task analysis conducted to derive the requirements for the extravehicular life support system and pressure suit. A baseline extravehicular mobility unit concept that was derived from trade studies to meet these requirements is summarized. It is shown that pressure suits improved over the Apollo and Skylab hardware will be required. Extravehicular activity (EVA) requirements for the Space Shuttle will be highly varied and are expected to average 1.3 hr per flight. About 98% of the EVAs are expected to be of 4-hour duration or less. M.V.E.

**A74-12582 * #** **An advanced highly mobile 8 psig pressure glove.** W. Elkins (Aerotherm/Acurex Corp., Mountain View, Calif.) and H. C. Vykukal (NASA, Ames Research Center, Moffett Field, Calif.). *American Institute of Aeronautics and Astronautics, Crew Equipment Systems Conference, Las Vegas, Nev., Nov. 7-9, 1973, Paper 73-1336.* 4 p.

Description of the current status and design features of the advanced highly mobile 8-psig-pressure Phase-I and Phase-II gloves. Advantages and shortcomings of the Phase-I glove are reviewed. The Phase-II glove is expected to provide the nearly optimum mobility and tactility required for an effective extravehicular-activity system. M.V.E.

**A74-12697 #** **Role of the hypothalamus in vegetative and cortical function regulation (Rol' gipotalamusa v reguliatsii vegetativnikh i korkovikh funktsii).** O. F. Makarchenko (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 19, Sept.-Oct. 1973, p. 579-585. In Ukrainian.

Electric excitation of the posterior hypothalamus and drug administration in experiments on rabbits caused some changes in EEG and cortical neural activity which suggest the functional and neurochemical homogeneity of the posterior hypothalamus. The background neural activity of visual cortex neurons was found to respond differently to the excitation of the posterior hypothalamus and to reticular excitation. Data are obtained concerning the participation of individual posterior hypothalamic structures in neurochemical mechanisms associated with the thermal stability of blood serum proteins. Clinical, physiological and biochemical investigations on human subjects with a vegeto-vascular diencephalic syndrome lead to the conclusion that the sympathic and parasympathic character of vegetative reactions depend on the level of the tonus of neurohumoral systems. V.Z.

**A74-12698 #** **Physiological characterization of the chemoreceptive structures of the posterior hypothalamus (Do pitannia pro fiziologichnu kharakteristiku khemoretseptivnikh struktur zadn'ogo gipotalamusa).** R. S. Zlatin (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 19, Sept.-Oct. 1973, p. 586-592. 12 refs. In Ukrainian.

The electric activity of the motor cortical region was studied in chronic experiments on rabbits with electrically excited posterior hypothalamic structures after subcutaneous administration of aminasine or scopolamine, and on rabbits with chronic administration of carbacholine or noradrenaline into posterior hypothalamic structures. The participation of the posterior hypothalamus in the electric activity of the motor cortical region is discussed on the basis of the results. V.Z.

**A74-12699 #** **Reticulo-hypothalamic influences on the neuron activity in the visual cortex of rabbits (Retikulogipotalamichni vplivi na aktivnist' neironiv zorovoi kori).** R. R. Velika (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 19, Sept.-Oct. 1973, p. 593-600. 26 refs. In Ukrainian.

Experiments on rabbits are conducted to study the influence of the posterior hypothalamus on the activity of individual visual cortex neurons with and without stimulation of the reticular formation of the midbrain. It is found that the stimulation of the nucleus of the posterior hypothalamus modulates the background rhythmicity in a cyclic mode but very rarely produces phased-type reactions in cortical neurons. Stimulation of the reticular formation produced in neurons predominantly inhibitive responses and decreased periodic background activity fluctuations. V.Z.

**A74-12700 #** **Investigation of the role played by chemoreceptive structures of the posterior hypothalamus in changes of the thermal stability of blood plasma proteins (Doslidzhennia roli khemoretseptivnikh struktur zadn'ogo gipotalamusa v zmini teplostiikosti bilkiv plazmi krovi).** B. A. Roitrub and R. S. Zlatin (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 19, Sept.-Oct. 1973, p. 601-607. 22 refs. In Ukrainian.

**A74-12701 #** **Dependence of the conditioned-reflex effect on the level and duration of hypothalamic stimulation (Zalezhnist' reflektornogo efektu vid sili i trivalosti podraznennia gipotalamusa).** A. G. Vozna (Kiivs'kii Derzhavnii Universitet, Kiev, Ukrainian SSR) and P. D. Kharchenko. *Fiziologichnii Zhurnal,* vol. 19, Sept.-Oct. 1973, p. 630-636. 12 refs. In Ukrainian.

Experiments on dogs show that the strength of a conditioned secretory alimentary reflex depends on both the duration and level of the current used for stimulation of the lateral hypothalamus. The reflex is inhibited when the current is weak, increases to a certain maximum and then decreases when the current increases, and vanishes when the current increases further. This behavior is linked to an inhibition process which develops simultaneously. V.Z.

**A74-12702 #** **Effect of the stimulation of various hypothalamic structures on the blood pressure in greater and pulmonary circulations (Vpliv podraznennia riznikh struktur gipotalamusa na krov'ianii tisk u velikomu i malomu koli krovoobigu).** G. V. Tam and V. O. Tsibenko (Kiivs'kii Derzhavnii Universitet, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 19, Sept.-Oct. 1973, p. 642-653. 31 refs. In Ukrainian.

Experiments were conducted on 40 anesthetized dogs in a study of the effects of electric stimulation of 18 different hypothalamic structures on the blood pressure in the femoral artery and the right ventricle of the heart. Almost all of the studied structures produced both pressor and depressor responses to stimulation, the former being much more frequent. The concentration of pressor points was greater in the posterior hypothalamus than in the anterior while that of depressor points was reversed. Maximum arterial pressure fluctuations were observed during the stimulation of the supraoptical posterior nucleus (pressor responses) and of the anterior nucleus (depressor responses) of the hypothalamus. V.Z.

**A74-12703 #** **Hypothalamic mechanisms of the compensatory hypertrophy of endocrinous glands (Gipotalamichni mekhanizmi kompensatornoi gipertrofii endokrinnikh zaloz).** B. G. Novikov and O. M. Ptitsia (Kiivs'kii Derzhavnii Universitet, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 19, Sept.-Oct. 1973, p. 654-660. 38 refs. In Ukrainian.

**A74-12704 #** **Influence of damage to the mesencephalic reticular formation on the hypothalamo-hypophysial neurosecretory system (Vpliv zruinuvannia retikuliarnoi formatsii seredn'ogo mozku na gipotalamo-gipofizarnu nirosekretornu sistemu).** O. A. Vashchenko (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii,

Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 19, Sept.-Oct. 1973, p. 661-666. 23 refs. In Ukrainian.

**A74-12705** # **Responses of the nuclei of the anterior hypothalamus to hypoxia (Reaktsiia iader perednʹogo gipotalamusa na vpliv gipoksii).** I. I. Gerzanich (Akademiia Nauk Ukrainskoi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 19, Sept.-Oct. 1973, p. 667-674. 16 refs. In Ukrainian.

The functions of the supraoptical and paraventricular nuclei of the hypothalamus were studied in albino rats subjected to one-hr hypoxia corresponding to altitudes of 4000, 7000 and 10,000 m. The daily activity rhythm of neurosecretory cells was upset by hypoxia in both nuclei. The arhythmicity was proportional to the hypoxia level and was higher in the supraoptical nucleus. The recovery time was shorter when the hypoxia level was lower. V.Z.

**A74-12706** # **Influence of the hypothalamus on endocrinic metabolic processes (Do pitannia pro vpliv gipotalamusa na obminno-endokrinni protsesi).** A. D. Lauta (Akademiia Nauk Ukrainskoi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 19, Sept.-Oct. 1973, p. 684-691. 24 refs. In Ukrainian.

Endocrine-metabolic disorders were studied in patients with vegeto-vascular diencephalic and neuroendocrinic syndromes. Radio indication techniques were applied to investigate the functional condition of the thyroid gland. Affliction of the hypothalamic region was found to upset metabolic processes and the function of endocrine glands. Synchronous stimulation of the functions of the adrenal cortex, thyroid gland, of the insular function of the pancreas, and lipolytic processes was established in cases with a hypertonic vegeto-vascular diencephalic syndrome. Suppression of metabolic endocrine functions, on the other hand, was established in cases with a hypotonic syndrome. V.Z.

**A74-12718** **Role of the adrenal glands in the development of severe hypertension.** O. A. Carretero, G. Enzmann, C. Polomski, A. Piwonska, N. B. Oza, and A. Schork (Henry Ford Hospital, Detroit; Michigan, University, Ann Arbor, Mich.). *Circulation Research*, vol. 33, Nov. 1973, p. 516-520. 23 refs. Research supported by the Michigan Heart Association; Grant No. PHS-HL-13982-03.

It has been previously shown that angiotensin II is involved in the pathogenesis of severe hypertension resulting from ligation of the aorta between the origins of the renal arteries. To see if part of the effect of the angiotensin II was due to the stimulation of mineralocorticoid secretion, blood pressure and plasma renin activity were studied after ligation of the aorta in adrenalectomized rats receiving maintenance doses of steroids. Rats subjected to adrenalectomy and aortic coarctation developed hypertension as severe as that in rats with intact adrenal glands. Thus, an increase in the secretory rate of adrenal hormones is not a pathogenetic factor in the development of severe hypertension after aortic coarctation.(Author)

**A74-12719** **Effect of sodium balance on arterial blood pressure and renal responses to prostaglandin A1 in man.** L. R. Krakoff, D. De Guia, N. Vlachakis, J. Stricker, and M. Goldstein (Mount Sinai School of Medicine, New York, N.Y.). *Circulation Research*, vol. 33, Nov. 1973, p. 539-546. 29 refs. Research supported by the Hoechst Pharmaceuticals, Inc.; Grants No. PHS-HL-13595; No. NIH-RR-71.

**A74-12727** **Changes in information-selection patterns in multisource monitoring as a function of induced arousal shifts.** R. Hockey (Durham, University, Durham, England). *Journal of Experimental Psychology*, vol. 101, Nov. 1973, p. 35-42. 14 refs.

**A74-12728** **Temporal segmentation of repeating auditory patterns.** S. Handel (Tennessee, University, Knoxville, Tenn.). *Journal of Experimental Psychology*, vol. 101, Nov. 1973, p. 46-54. 10 refs. Grant No. PHS-MH-15969.

Experimental investigation of the identification of repeating auditory patterns segmented by temporal pauses. The results indicate that the effect of temporal organization is pervasive. In most tasks, it appears very difficult not to allow the temporal spacing not to dominate organization. M.V.E.

**A74-12729** **Prototype abstraction and classification of new instances as a function of number of instances defining the prototype.** D. Homa, J. Cross, D. Cornell, D. Goldman, and S. Shwartz (New College, Sarasota, Fla.). *Journal of Experimental Psychology*, vol. 101, Nov. 1973, p. 116-122. 9 refs.

Ease of prototype abstraction and recognition of new instances belonging to the prototype is experimentally shown to be facilitated by increasing the number of instances sorted together during original learning. The experiment results suggest that the abstraction of a prototype undergoes repeated change as a function of the number of instances which define it, and that the ability to correctly recognize new exemplars of a concept is also dependent upon the number of instances. M.V.E.

**A74-12798** # **Spatial orientation as a problem of bioastronautics.** G. L. Komendantov and K. A. Pimenova. *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 11 p.

Comparative study of the human functional system perceiving space per se under ordinary ground conditions and of a new functional system perceiving space per se under space flight conditions. The functional system perceiving space per se under ordinary ground conditions consists of the visual, vestibular, proprioceptive, mechanocutaneous, and internal analysors, with the visual analyzer taking the leading role in spatial perception. The fact that the common functional system perceiving space per se acts in two variants - either with vision involvement or without it - is taken into account in the purposeful formation of a new functional system for application to space flight conditions and to prolonged sojourns of man on other planets. It is also necessary to take into account the importance of extracabin visual nonmediated and mediated clues in the formation of a new functional system. The necessity of forming several variants of the space-perceiving functional system in astronauts is stressed - one for astronauts under conditions of weightlessness during space flight, one for astronauts remaining for long periods of time on board orbital stations, and one for astronauts sojourning on other planets. A.B.K.

**A74-12806** # **Biological effects of heavy ions of cosmic radiations.** H. Planel, Y. Blanquet, J. P. Soleihavoup, and R. Kaiser (Toulouse, Université, Toulouse; CNRS, Centre de Recherches Nucléaires de Strasbourg, Strasbourg-Cronenburg, Bas-Rhin, France). *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 6 p. 5 refs.

The effect of heavy cosmic ray ions on the biological development of Artemia salina eggs was studied in simulation experiments with eggs embedded in polyvinyl-alcohol solutions in stacks of nuclear K2 and K5 isotope emulsions. Vibrations and accelerations similar to those of the Apollo 16 mission showed no effect on eggs in a nucler emulsion stack. V.Z.

**A74-12823** # **Reliability of life support systems as related to general space flight safety requirements.** B. A. Adamovich and G. G. Ter-Minasian (Ministry of Public Health, Institute of Biomedical Problems, Moscow, USSR). *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 14 p. 14 refs.

The application of a differential game approach to the determination of the reliability of a space life support system is described, and is illustrated by a comparative evaluation of three life support system versions. Input data for determining the evaluation indices are tabulated, and the game matrix is presented. V.P.

**A74-12824** # **Main results of the 30-day integrated ground-based experiment and flight tests of the water electrolysis cell.** B. A. Adamovich, B. A. Gavrilov, B. G. Grishaenkov, and Iu. G. Nefedov. *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 12 p.

An integrated physiological-hygienic and biotechnological laboratory experiment was conducted to evaluate the effect of life-support subsystems inside a sealed cabin on the cabin environment. The environmental changes affect human performance and activity. Questions concerning the ability of the crewmen to operate the subsystems are also examined, giving attention to resulting difficulties. The three stages in the tests regarding the water-electrolysis unit include preflight tests, tests aboard an artificial satellite, and a postflight operation test. G.R.

**A74-12833** # **Physiological and hygienic factors affecting the design of certain particular prophylactic measures against the harmful effects of weightlessness (Fiziologo-gigienicheskoe obosnovanie konstruktsii nekotorykh individual'nykh sredstv profilaktiki neblagopriiatnogo deistviia nevesomosti).** A. S. Barer, A. P. Savinov, G. I. Severin, A. Iu. Stoklitskii, and E. P. Tikhomirov. *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 15 p. 10 refs. In Russian.

**A74-12834** # **Problem of decompression disturbances in space flights and on the earth.** P. M. Gramenitskii, A. G. Dianov, L. A. Briantseva, L. V. Kaliuzhnyi, I. P. Poleshchuk, and K. S. Iurova. *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 9 p.

Aerospace research on decompression-induced disturbances in the human organism is reviewed to demonstrate the importance of such studies for reducing decompression hazards encountered in various earth-bound activities. Functional disturbances resulting from the formation of gas bubbles in the organism upon decompression are described, and attention is given to the effects of atmospheric composition, partial pressures, exposure durations, tissue saturation by nitrogen, blood flow velocity, and exercise. T.M.

**A74-12835** # **Investigation of a process of water regeneration from urine by an electrochemical method (Issledovanie protsessa regeneratsii vody iz mochi elektrokhimicheskim metodom).** V. A. Gromyko, T. B. Tsygankova, V. B. Gaidadymov, Z. P. Pak, and Iu. B. Vasil'ev. *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 12 p. 9 refs. In Russian.

Electrochemical techniques were used to study processes involving decomposition of organic components in urine by anodic oxidation, subsequent demineralization of the intermediate substances, and purification of the regenerated water by sorbents. The mechanism involved in electrochemical oxidation of the main organic components of urine is examined in detail, and both qualitative and quantitative analyses of the regenerated water are used to evaluate sanitary and hygienic aspects relative to human consumption. Contents of nitrogenous compounds in urine at different levels of oxidation are tabulated together with the composition and qualitative features of regenerated and mineralized water. T.M.

**A74-12837** # **Some results for water-salt metabolism and renal function in humans during bed rest (Nekotorye rezul'taty korrektsii vodno-solevogo obmena i funktsii pochek cheloveka pri postel'nom rezhime).** L. I. Kakurin, A. I. Grigor'ev, and G. I. Kozyrevskaia. *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 17 p. 7 refs. In Russian.

Pituitrin, nerobol, DOCA, and angiotensine were administered to 44 subjects confined to bed rest for up to 120 days in a study of the mechanisms of water-salt metabolism and renal function during prolonged hypokinesia. A normalizing effect of these drugs on water-salt metabolism under hypokinesia is established. The state of the hormonal system responsible for variations in water-electrolyte homeostasis is determined. More insight is gained in the mechanism of renal function regulation during hypokinesia. V.Z.

**A74-12841** # **Culture of hydrogen bacteria as a perspective source of protein for earth needs and ecological life-support systems.** I. A. Terskov, I. I. Gitel'zon, F. Ia. Sid'ko, P. I. Ponomarev, I. N. Trubachev, Ia. V. Voitovich, and I. V. Volov (Akademiia Nauk SSSR, Institut Fiziki, Krasnoyarsk, USSR). *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper,* 19 p.

**A74-12851** # **Study of the experimental complex of personal hygiene equipment.** B. A. Adamovich, V. A. Korsakov, V. P. Efimov, V. V. Borshchenko, and K. V. Zarubina. *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 15 p.

Description of the design, operation, and simulation testing of waste-disposal and personal-hygiene equipment developed as part of a life-support system intended for prolonged manned space missions. Individual equipment discussed includes washing stands, vacuum cleaner, solid-waste processing devices, urine disposal system, shower, and laundry units. Test data from two-month experimental confinement of three subjects are tabulated in the form of water quality measures and bacterial counts on surfaces of equipment and personnel. T.M.

**A74-12857** # **An optimized space rescue system.** F. X. Kane (TRW Systems Group, Redondo Beach, Calif.). *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 36 p. 17 refs.

The problem of designing and developing an optimized space rescue system in the light of new and changing aspects of manned space flight is examined. It is shown that, in the light of recent developments, earlier analyses which predicted rescue times of several days should be modified to provide rescue times of less than one day. Among such developments is the introduction of the Space Shuttle (and its upper stage) and of techniques which, even in the most extreme emergencies, will permit the crew to abandon the craft and to find shelter in orbit before being returned to earth. V.P.

**A74-12861** # **Investigation of atmosphere purification from carbon dioxide by amino silicagels.** I. A. Danilychev, B. L. Avetisiants, and V. V. Strelko. *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 16 p.

Regenerative amino silicagels have been evaluated for use as carbon dioxide absorbers aiding purification of the atmosphere in closed environmental control systems. Static and dynamic characteristics of carbon dioxide adsorption and desorption are illustrated in curves showing the effects of humidity, temperature, and flow velocity. The amino silicagel adsorbents do not require preliminary drying of the air, are capable of absorbing carbon dioxide over a wide range of humidity in the gas-air flow, exhibit relatively mild regeneration requirements, and do not deteriorate in adsorption capacity during extended work cycles. Ground-based testing of an atmosphere purification system employing amino silicagels is described. T.M.

**A74-12870** # **Survey of space flight safety systems.** R. Fleisig (Grumman Aerospace Corp., Bethpage, N.Y.). *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 19 p. 36 refs.

Recent contributions to the development of space flight safety systems, rescue systems, and life support systems are reviewed. The topics covered are: human stress tolerances, a global rescue network, Skylab rescue capability, the Space Shuttle as a rescue vehicle, tumbling spacecraft rescue operations, space station safety design, safety requirements to counter space shuttle experiment equipment hazards, and rescue configurations for emergency crew transfer. V.P.

**A74-12871** # **Effects of reduced muscular activity upon cardiovascular system as an actual problem of modern medicine.** B. M. Fedorov (Institute of Biomedical Problems, Moscow, USSR). *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 9 p.

A marked decrease in motor activity may result in changes of dystrophic nature. This problem is of special interest to space medicine. Experimental results are reported of studies concerning the changes in the myocardium and the cardiac regulatory system during hypokinesia. Experiments had been conducted with 350 rabbits. Changes in catecholamine and hormonal metabolism are discussed together with electrolyte changes in the myocardium and functional changes in the vegetative centers of the brain. G.R.

**A74-12873** # **Radiation protection reliability and space flight safety.** E. E. Kovalev (Akademiia Nauk SSSR, Moscow, USSR). *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 16 p. 18 refs.

It is shown that by applying the concept of acceptable risk to the spacecraft radiation protection problem, protection reliability can be determined as a function of heat-shield weight for various conditions of prolonged missions. Using this approach, the radiation protection reliabilities of different system can be compared on the basis of a single safety criterion. V.P.

**A74-12880** # **Certain medical aspects of crew survival after forced descent of flight vehicles on land or water in an unpopulated area (Nekotorye meditsinskie voprosy spaseniia ekipazhei letatel'nykh apparatov posle ikh vynuzhdennogo prizemleniia /privodneniia/ v bezliudnoi mestnosti).** V. G. Volovich. *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 7 p. In Russian.

**A74-12884** # **Space medicine and public health.** N. M. Rudnyi and A. D. Voskresenskii. *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 8 p.

Consideration of the possibility of utilizing a number of specific achievements of space medicine in public health systems. The utility of experiments in which weightlessness was simulated either by immersion or by strict bed rest in the differentiation of pathological manifestations and effects of bed rest in patients is noted. The use of indirect (bloodless) methods of hemodynamics parameter determination in clinico-physiological investigations is discussed, as well as the use of dielectric and ultrasonic methods of cardiac monitoring without galvanic connections. Finally, the use of methods of predicting tolerance to extremal flight conditions in occupational selection and in the identification of conditions which border between normal and pathological is noted. A.B.K.

**A74-12887** # **Scientific renaissance of legal theory - The manned orbiting space station as a contemporary workshop.** G. S. Robinson (Smithsonian Institution, Washington, D.C.). *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 37 p. 29 refs.

Discussion of the need for the development of new legal structures suitable for governing the operation of manned space stations. It is shown that manned space activities require the development of unique cultural and legal institutions which are not a mere extension of familiar anthropocentric legal positivisms into the new arena of man in space. The importance of science and an appropriate philosophical underpinning in the development of a correct legal theory for space stations is stressed. The impact of contemporary science on legal theory is discussed, stressing the necessity of formulating legal regimes derived from analyses ranging from practical and theoretical neurophysics to phenomenological observations of predictable behavior sequencing patterns. In addition, the capability of formulating predictive models for individual and societal characteristics of each space station participant requires the ability to quantify sensed or perceived phenomena, without relying on unstable senses of ethics and morality. A.B.K.

**A74-12888** # **Radiobiological problems posed by supersonic and space flights (Problèmes radiobiologiques posés par les vols supersoniques et spatiaux).** C. Chevalier (Institut Gustave-Roussy, Villejuif, Val-de-Marne, France). *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 9 p. 14 refs. In French.

The effects of prolonged exposure to ionizing radiations on the human organism are examined. It is shown that the radiation protection problems are very different for supersonic and space flights, and that no risks may be taken in supersonic flights in which thousands of people will be accommodated in near future. The principal problem in supersonic flight is that of pregnant women. The precautions taken in space flight reduce the radiation hazard to levels encountered by people working with ionizing radiation in other fields. V.P.

**A74-12910** * # **Atmosphere revitalization for manned spacecraft - An assessment of technology readiness.** F. H. Samonski, Jr. (NASA, Johnson Space Center, Houston, Tex.) and J. M. Neel (United Aircraft Corp., Hamilton Standard Div., Windsor Locks, Conn.). *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 50 p. 14 refs.

The level of proficiency attained by the most effective physical and chemical regenerative processes capable of providing a habitable atmospheric environment in a spacecraft is assessed. It is shown that both the Sabatier and Bosh reactions are in a mature stage of technological readiness and can effectively reduce the carbon dioxide in a spacecraft. An electrochemical method for concentrating CO2 from an air environment offers promise to approach low levels of pCO2 control. Technological advances in the fields of solid polymer electrolytes and oxygen evolution electrocatalysts have led to a water electrolysis system that can maintain efficient performance for several years. Nitrogen supply and control of the composition of the spacecraft atmosphere is effectively provided by the circulating electrolyte technique. V.P.

**A74-12967** **Interaction of rate and preload on developed tension in isometric papillary muscle.** D. L. Rutlen (Massachusetts General Hospital, Boston, Mass.) and W. J. Powell, Jr. (Harvard University, Boston, Mass.). *American Journal of Physiology,* vol. 225, Nov. 1973, p. 1015-1019. 9 refs.

The data obtained in the studies indicate that preload effects both the extent and the direction of inotropic change in response to an increase in the frequency of contraction. As the frequency of stimulation is increased, the first derivative of isometric developed tension increases and the time-to-peak tension and time to half-relaxation decrease at greater rates at a high preload. The preload parameter may, therefore, determine whether a given intervention produces only a moderate or a very marked increase in inotropy. G.R.

**A74-12968** **Substrate depletion in different types of muscle and in liver during prolonged running.** K. M. Baldwin, J. S. Reitman, R. L. Terjung, W. W. Winder, and J. O. Holloszy (Washington University, St. Louis, Mo.). *American Journal of Physiology*, vol. 225, Nov. 1973, p. 1045-1050. 43 refs. Grant No. PHS-HD-01613.

Previous studies have shown that glycogen and triglyceride stores in skeletal muscle are depleted during muscular work. It seemed possible, therefore, that measurements of the concentrations of these substrates, as indicators of prior contractile activity, might provide some information regarding the degree of involvement, relative to each other, of three types of muscle fibers in exercise of various intensities. The three types include white fibers, red fibers, and intermediate fibers. The time course of depletion of substrate stores was determined during an exercise session. G.R.

**A74-12969** **Effect of metabolic inhibitors and oxygen on responses of human umbilical arteries.** N. Nair and D. C. Dyer (Washington, University, Seattle, Wash.). *American Journal of Physiology*, vol. 225, Nov. 1973, p. 1118-1122. 22 refs. Research supported by the University of Washington and Washington Heart Association; Grant No. NIH-GM-15991.

A study on human umbilical arteries was initiated to investigate the effect of oxygen concentration as well as sodium cyanide and 2,4-dinitrophenol on responses to serotonin. It was found that human umbilical arteries responded in a manner similar to that previously observed for human umbilical veins in the presence of metabolic inhibitors, but maximal response of arteries to serotonin at low oxygen partial pressure was significantly less than that observed with the umbilical veins. The results indicate that the response to serotonin is augmented in a linear fashion as oxygen partial pressure is increased within the physiological range. G.R.

**A74-12970** **Effects of temperature on responses of fresh and refrigerated perfused blood vessels.** J. C. Murphy, O. Carrier, Jr., and J. Sahadi (Texas, University, San Antonio, Tex.). *American Journal of Physiology*, vol. 225, Nov. 1973, p. 1187-1191. 15 refs. USAF-supported research.

A study was conducted to assess the influence of both prolonged cold storage and acute temperature changes on vascular resistance and on drug responses. It was found that acute changes in temperature had little effect on the resistance of perfused, isolated, small arteries. However, on comparing the resistance of fresh and refrigerated vessels, it was found that the resistance of the fresh vessels was significantly less than that of the refrigerated vessels at all temperatures below 37 C, but not at temperatures above 37 C. G.R.

# STAR ENTRIES

**N74-10089*#** Stanford Univ., Calif. School of Medicine.
**SLEEP MECHANISMS: SLEEP DEPRIVATION AND DETECTION OF CHANGING LEVELS OF CONSCIOUSNESS Final Report**
William C. Dement and Jack D. Barchas [1972] 5 p
(Grant NGR-05-020-576)
(NASA-CR-136023) Avail: NTIS HC $3.00 CSCL 06S

An attempt was made to obtain information relevant to assessing the need to sleep and make up for lost sleep. Physiological and behavioral parameters were used as measuring parameters. Sleep deprivation in a restricted environment, derivation of data relevant to determining sleepiness from EEG, and the development of the Sanford Sleepiness Scale were discussed. E.H.W.

**N74-10090*#** California Univ., Berkeley. White Mountain Research Station.
**PHYSIOLOGICAL RESPONSES TO ENVIRONMENTAL FACTORS RELATED TO SPACE FLIGHT Semiannual Status Report, 1 Feb. -31 Jul. 1973**
Nello Pace 31 Jul. 1973 43 p
(Grant NGL-05-003-024)
(NASA-CR-135946; Rept-23) Avail: NTIS HC $4.25 CSCL 06P

Physiological base line data are established, and physiological procedures and instrumentation necessary for the automatic measurement of hemodynamic and metabolic parameters during prolonged periods of weightlessness are developed. Author

**N74-10091*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**EVALUATION OF POSITIVE G SUB Z TOLERANCE FOLLOWING SIMULATED WEIGHTLESSNESS (BEDREST)**
Lester B. Jacobson (PHS Hospital, San Francisco), Kenneth H. Hyatt (PHS Hospital, San Francisco), Robert W. Sullivan (PHS Hospital, San Francisco), Stephen A. Cantor (PHS Hospital, San Francisco), Harold Sandler (PHS Hospital, San Francisco), Salvadore A. Rositano, and Ronald Mancini Aug. 1973 96 p refs Prepared in cooperation with PHS Hospital, San Francisco
(NASA-TM-X-62311) Avail: NTIS HC $7.00 CSCL 06S

The magnitude of physiologic changes which are known to occur in human subjects exposed to varying levels of + G sub Z acceleration following bed rest simulation of weightlessness was studied. Bed rest effects were documented by fluid and electrolyte balance studies, maximal exercise capability, 70 deg passive tilt and lower body negative pressure tests and the ability to endure randomly prescribed acceleration profiles of +2G sub Z, +3G sub Z, and +4G sub Z. Six healthy male volunteers were studied during two weeks of bed rest after adequate control observations, followed by two weeks of recovery, followed by a second two-week period of bed rest at which time an Air Force cutaway anti-G suit was used to determine its effectiveness as a countermeasure for observed cardiovascular changes during acceleration. Results showed uniform and significant changes in all measured parameters as a consequence of bed rest including a reduced ability to tolerate +G sub Z acceleration. The use of anti-G suits significantly improved subject tolerance to all G exposures and returned measured parameters such as heart rate and blood pressure towards or to pre-bed-rest (control) values in four of the six cases. Author

**N74-10092*#** Minnesota Univ., Minneapolis. Space Science Center.
**ENVIRONMENTAL MICROBIOLOGY AS RELATED TO PLANETARY QUARANTINE**
Irving J. Pflug Jun. 1972 81 p refs
(Grant NGL-24-005-160)
(NASA-CR-135980; SAPR-8) Avail: NTIS HC $6.25 CSCL 06M

The survival of Bacillus subtilis var. niger spores suspended in solutions of sucrose and glycerol at calculated water activities and varying temperatures was studied. The overall results indicated that as the water activity of the liquid decreased from .99 to .85, the heat resistance of the spores increased. The nature of the substance controlling the water activity, and the history of the spores prior to treatment also had an affect on their heat resistance. G.G.

**N74-10093#** World Meteorological Organization, Geneva (Switzerland).
**THE ASSESSMENT OF HUMAN BIOCLIMATE: A LIMITED REVIEW OF PHYSICAL PARAMETERS**
H. E Landsberg 1972 48 p refs
(WMO-331; TN-123) Avail: NTIS HC $4.50; WMO, Geneva

Various indices were developed to assess the effects of heat and cold on human beings. They include all elements of the energy balance. These indices require measurements not generally made by meteorological services. But, at the cold end, the factors of wind chill (a combination of temperature of wind speed) or cooling power (including radiative factors) and, at the warm end, effective temperature (a combination of temperature, humidity, and sometimes wind) have proved adequate for biometeorological purposes. The indices can be readily obtained from meteorological measurements or easily available equipment. Bioclimatic classifications to characterize comfort conditions at various localities or for mapping of these conditions for an area were attempted. They are based on atmospheric enthalpy, cooling power, or wind chill. ESRO

**N74-10094#** Naval Aerospace Medical Research Lab., Pensacola, Fla.
**OPERANT BEHAVIOR OF RHESUS MONKEYS IN THE PRESENCE OF EXTREMELY LOW FREQUENCY-LOW INTENSITY MAGNETIC AND ELECTRIC FIELDS (EXPERIMENT 2)**
John deLorge 15 Mar. 1973 29 p refs
(MF51524015)
(AD-764532; NAMRL-1179) Avail: NTIS CSCL 06/18

Consonant with the U.S. Navy's exploration of the biological effects of extremely low frequency electromagnetic radiation, the present studies exposed two rhesus monkeys to 10-gauss 45-Hz and 10-Hz fields. Low intensity electric fields occurred simultaneously. No effects of the 45-Hz fields on immediate memory, operant responding, reaction time, or activity were observed. Statistically significant effects were produced by 10-Hz fields, but not in both animals nor in a replication of the experiment. The study failed to provide unequivocal evidence that ELF magnetic and electric fields affect behavior, although weak support for effects of 10-Hz fields on general motor activity was given.
Author (GRA)

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**N74-10095#** Kyushu Univ., Fukuoka (Japan). Dept. of Parasitology.
**CHANGES IN ELECTROENCEPHALOGRAM SPECTRA DURING REPEATED EXPOSURE TO +Gz ACCELERATION**
Jan Berkhout, Robert D. ODonnell, and Sidney Leverett Wright-Patterson AFB, Ohio AMRL Jun. 1973 37 p refs
(Contract AF 49(638)-1387; AF Proj. 7184)
(AD-764815; AMRL-TR-72-123) Avail: NTIS CSCL 06/19

Eight human subjects experienced a series of +Gz acceleration profiles reaching peak values of +41/2 Gz and +6 Gz. Each subject experienced six 45-second +Gz exposures within 15 minutes. Electroencephalograms (EEG) were made throughout this period and subjected to a narrow-band spectral analysis within 10-second epochs. The subjects wore protective G-suits, and did not experience impairment of central vision during the runs analyzed. Small increases in spectral intensity of the EEG were seen during eyes-closed, resting epochs following +Gz exposure. These increases did not change overall shape of spectral profiles and did not exceed normal levels of EEG intensity. During +Gz forces with eyes open, the raw EEG was dominated by electromyographic (EMG) activity, which was typically proportional to instantaneous +Gz force but might also reflect paroxysmal whole-body contractions occurring at scattered points in the +Gz exposure profile. Increased EEG intensities greatly exceeding basal levels for certain narrow frequency bands were observed during actual +Gz exposures. In all subjects, a return to normal EEG spectral intensity profiles took place within 30 seconds of termination of acceleration. (Modified author abstract) GRA

**N74-10096#** Human Engineering Labs., Aberdeen Proving Ground, Md.
**NOISE AND BLAST**
David C. Hodge and Georges R. Garinther Jun. 1973 68 p refs
(AD-765419; HEL-TM-10-73) Avail: NTIS CSCL 06/19

The effects of noise and blast upon man are complex and varied. Although this report is directed primarily toward the noise produced during space activities the effects upon man will be similar regardless of the specific noise source. Data are presented dealing with physical acoustics, the characteristics of sound and appropriate noise measurements. Hearing loss resulting from both steady-state and impulse noise is discussed along with the factors influencing its acquisition and recovery and the resultant effects upon performance. Subjective and behavioral response to noise is discussed in terms of masking of auditory signals and speech, annoyance and general observation. Current research in the area of nonauditory effects is reviewed varying from cardiovascular alteraltions to the risk of death. Current design criteria are presented for both steady-state and impulse noise for both workspaces and communities. Author (GRA)

**N74-10097** National Lending Library for Science and Technology, Boston Spa (England).
**ADYSPAROPSIS AND CONTRAST SENSITIVITY**
M. A. Faermark Jul. 1973 10 p refs Transl. into ENGLISH from Svetotekhnika (USSR), no. 11, 1972 p 8-10
(NLL-RTS-8197) Avail: Natl. Lending Library, Boston Spa, Engl., £0.90; 3 NLL photocopy coupons

The effects of dynamic variations in basic contrast sensitivity and of achromatic adysparopsis on the development of ocular fatigue during visual tasks were studied. Comparison of the levels of these two functions as measured before and after proof reading work under different lighting conditions established the optimal illumination in the region of 1200 to 1300 lux. G.G.

**N74-10098*#** National Aeronautics and Space Administration, Washington, D.C.
**SKYLAB EXPERIMENTS. VOLUME 4: LIFE SCIENCES**
May 1973 99 p refs
(NASA-EP-113) Avail: NTIS MF $1.45; SOD HC $2.60 Domestic Postpaid or $2.25 GPO Bookstore CSCL 06B

The life sciences experiments conducted during Skylab missions are discussed. The general categories of the experiments are as follows: (1) mineral and hormonal balance, (2) hematology and immunology, (3) cardiovascular status, (4) energy expenditure, (5) neurophysiology, and (7) biology. Each experiment within the general category is further identified with respect to the scientific objectives, equipment used, performance, and data to be obtained. Author

**N74-10099*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
**REMOTE MANIPULATOR SYSTEM Patent Application**
D. A. Kugath, Herman T. Blaise, and Dan H. Dane, inventors (to NASA) Filed 11 Oct. 1973 28 p
(NASA-Case-MFS-22022-1; US-Patent-Appl-SN-405341) Avail: NTIS HC $3.50 CSCL 05H

A master-slave manipulator system with two master units is described. The system is controlled by the two arms and hands of an operator and two corresponding slave units. Both the master and the slave units have a first arm rotatably mounted to the floor at 30 deg from the vertical, a second arm pivoted to it and mounted for rotation, and a third arm pivoted to the second arm. The slave has a pivotally and rotatably mounted gripper unit while the master has a pivotally mounted unit with manual switch controls. The servomechanism system includes a solid state control circuit, and flat, helically wound, internal ribbons of wires. NASA

**N74-10100*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
**ORTHOTIC ARM JOINT Patent Application**
Dan H. Dane, inventor (to NASA) Filed 4 Oct. 1973 14 p
(NASA-Case-MFS-21611-1; US-Patent-Appl-SN-403694) Avail: NTIS HC $3.00 CSCL 05H

An improved orthopedic (orthotic) arm joint that can be used in various joints of mechanical arms is presented. The arm joint includes a worm, which is coupled to an electric motor for rotating a worm gear carried within a rotatable housing. The worm gear is supported on a thrust bearing and the rotatable housing is supported on a radial thrust bearing. A bolt extends through the housing, bearings, and worm gear for securing the device together. A potentiometer extends through the bolt, and is coupled to the rotatable housing for rotating, so as to produce an electrical signal indicating the angular position of the rotatable housing. NASA

**N74-10101*#** Life Systems, Inc., Cleveland, Ohio.
**ELECTROCHEMICAL CARBON DIOXIDE CONCENTRATOR: MATH MODEL Final Report**
R. D. Marshall, F. H. Schubert, and J. N. Carlson Aug. 1973 81 p refs
(Contract NAS2-6478)
(NASA-CR-114639; LSI-ER-134G-6) Avail: NTIS HC $6.25 CSCL 06K

A steady state computer simulation model of an Electrochemical Depolarized Carbon Dioxide Concentrator (EDC) has been developed. The mathematical model combines EDC heat and mass balance equations with empirical correlations derived from experimental data to describe EDC performance as a function of the operating parameters involved. The model is capable of accurately predicting performance over EDC operating ranges. Model simulation results agree with the experimental data obtained over the prediction range. Author

**N74-10102#** Loughborough Univ. of Technology (England). Dept. of Transport Technology.
**PASSENGER COMFORT LIMITATIONS ON THE DESIGN OF HIGH SPEED TRANSPORTATION SYSTEMS**

N. M. Hawkins Jul. 1973 52 p refs
(TT-7309) Avail: NTIS HC $4.75

Problems involved in evaluating a passenger's tolerance of discomfort and defining design criteria for comfort are discussed. Some of the available information on comfort is reviewed for a wide variety of physical parameters of the vehicle environment; noise, vibration and thermal comfort, as well as a more theoretical consideration of the nature of subjective comfort are considered. Author

**N74-10103#** Southeastern Massachusetts Univ., North Dartmouth. Inst. of Sound and Vibration Research.
**SECONDARY TASK PERFORMANCE OF HELICOPTER PILOTS DURING LOW LEVEL FLIGHT**
B. K. NagarajaRao and M. J. Griffin Dec. 1971 61 p refs
(ISVR-TR-54) Avail: NTIS HC $5.25 CSCL 05E

Changes in performance at a complex reaction time task during helicopter flight are studied. The two-choice reaction time task employed required responses to a continuous tone and a similar tone pulsed with a 6 Hz repetition frequency. Eight pilots flew two hour flights consisting of 15 minutes at 1000 ft, 90 minutes at 100 ft, and a further 15 minutes at 1000 ft. The mean reaction time data obtained exhibit no significant change between the three flying conditions. Within the low level portions of the flights there was a significant increase in mean reaction time after forty-five minutes of low level flying. With the small pilot sample employed there is evidence of reaction time performance differences between experienced and less experienced pilots. Author

**N74-10104#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
**CONCEPT OF FAILURE AS APPLIED TO HUMAN OPERATION**
A. I. Gubinskii and G. V. Sukhodolskii 27 Jul. 1973 16 p refs Transl. into ENGLISH from the book " Psikhologiya v Priborostr., S. B. Inzh." USSR, 1967 p 124-131
(AD-764920; FTD-HT-23-694-73) Avail: NTIS CSCL 05/10

The concept of failure is one of the main concepts in the theory of reliability, and deserves special consideration. Technically failure is an event in which the system totally or partially loses its work capacity as a result of which functions assigned by the system, are not fulfilled. GRA

**N74-10105#** Naval Aerospace Medical Research Lab., Pensacola, Fla.
**THE PREDICTION OF PILOT PERFORMANCE IN THE F-4 AIRCRAFT**
Richard H. Shannon and Wayne L. Wang 9 Jul. 1973 13 p refs
(MF51524002)
(AD-764866; NAMRL-1186) Avail: NTIS CSCL 05/9

In previous investigations, attempts were made to isolate the most critical skills and procedures within each stage of replacement air group (RAG) training in the F-4 aircraft. For each of the stages analyzed, a small set of items were selected on the basis that they could discriminate among replacement pilots according to their final RAG grade. On the basis of these isolated skills, two fleet evaluation questionnaires were developed to be used by operational F-4 squadron commanders. In addition to ratings on these two rating forms, squadron commanders were asked to report critical incidents. These included such occurrences as accidents, incidents, and wings-pulled. Data obtained from these two forms were used as the criterion measures in the investigation. Selected test scores and flight grades from undergraduate pilot training were used as potential predictors. These were related to the criteria in a series of correlational and regression analyses. A number of significant relationships were obtained among the performance measures. Such results indicated the method used in developing the rating form to be a feasible one. Implications are discussed in terms of potential use for actual assignment of aviators to RAG training in the F-4 aircraft. Author (GRA)

**N74-10106#** Human Engineering Labs., Aberdeen Proving Ground, Md.
**A HUMAN FACTORS ENGINEERING ASSESSMENT OF AN ANATOMICALLY CONFORMING AIRCREW BODY ARMOR SYSTEM**
Bernard M. Corona and R. Douglas Jones Jun. 1973 90 p refs
(AD-766296; HEL-TM-9-73) Avail: NTIS CSCL 19/4

An anatomically conforming, four-size, aircrew body armor (ACBA) system, developed by US Army Natick Laboratories, was assessed to determine its compatibility with Army aviator body sizes, flight task requirements and aircrew station geometry. As a base for all comparisons the standard three-size, aircrew body armor (SBA) system was used. Where possible an attempt was made to integrate and utilize elements of the HEL Armor System Development/Evaluation Guideline, TM 18-69. Thirty enlisted men and six officer pilots were used as subjects. As a result of this HFE assessment it has been determined that the ACBA system was not suitable as proposed, the SBA system has serious shortcomings, and the HEL TM 18-69 cannot be utilized for the development or evaluation of body-worn armor systems. Author (GRA)

**N74-10107#** Air Force Human Resources Lab., Brooks AFB, Tex. Advanced Systems Div.
**MODELING OF THE HUMAN FORCE AND MOTION SENSING MECHANISMS Final Report, Nov. 1971 - Jun. 1972**
Don R. Gum Jun. 1973 92 p refs
(AF Proj. 6114)
(AD-766444; AFHRL-TR-72-54) Avail: NTIS CSCL 06/19

The purpose of the study was to investigate human force and motion-sensing mechanisms, to develop models for the prominent or potentially artificially stimulatable mechanisms, to implement them on an analog computer, and to investigate their responses to various force and motion-forcing functions. Models were implemented and tested for a semicircular canal, the otolith, head motion muscle spindle sensing, and body seat pressure sensing. Tests of the models have demonstrated the relative time delays between applied force and perceived force for the various mechanisms, showing that both the muscle spindle and pressure-sensing mechanisms perceive an applied force much more rapidly than the vestibular system. Also, the long adaptation phenomenon associated with the semicircular canals which seems to degrade their usefulness in flight and the rapid adaptation phenomenon associated with the pressure sensors which makes them important sensors for consideration in the design of motion systems have been shown through model testing. (Modified author abstract) GRA

**N74-10108#** McDonnell-Douglas Astronautics Co., St. Louis, Mo.
**INVESTIGATION OF MANUAL CONTROL IN SECONDARY FLIGHT TRACKING TASKS Annual Technical Report**
James G. Curtin, John H. Emery, and Thomas G. Drennen 15 Aug. 1973 59 p refs
(Contract N00014-72-C-0264; NR Proj. 196-120)
(AD-766070; MDC-E0890) Avail: NTIS CSCL 05/5

Four radar control configurations were evaluated for a target acquisition and tracking task as part of a research program directed to control simplification. Control variables included type of control action (displacement or force), location (integrated into throttles or independent), and personal equipment (gloves or no gloves). The four controls were compared for a simulated air-to-ground weapons delivery mission with two navigation segments and a target tracking phase. Sixteen pilots served as subjects in the study. The experimental task was performed in a part-task simulator, employing a PDP-12 general purpose digital computer, a fixed-base crew station configured to resemble an attack aircraft, and the necessary interface software and equipment. Target acquisition and tracking data, time-on-target, and flight command deviations for pitch and roll attitude and airspeed control were recorded. (Modified author abstract) GRA

**N74-10953** Joint Publications Research Service, Arlington, Va.
**SPACE BIOLOGY AND MEDICINE, VOLUME 7, NO. 5, 1973**
7 Nov. 1973 7 p refs Transl. into ENGLISH of Kosm. Biol. Med. (Moscow), v. 7, no. 5, Sep. - Oct. 1973 p 391
(JPRS-60471) HC $9.25

Articles concerning the selection and training of cosmonauts are presented. Data cover: evaluation and analysis of accumulated data to faciliate the on-going transition from orbital to interplanetary flights, research aimed at guaranteeing safety on long flights and reliability of human component of the man-spaceship system, space psychology and physiology, environmental problems and control (spacecraft habitability, effects radiation and weightlessness) and telemetry.

**N74-10954** Joint Publications Research Service, Arlington, Va.
**DETECTION OF EXTRATERRESTRIAL LIFE FORMS AND CRITERIA FOR THE EXISTENCE OF BIOLOGICAL SYSTEMS**
A. B. Rubin *In its* Space Biol. and Med., Vol. 7, No. 5, 1973 (JPRS-60471) 7 Nov. 1973 p 1-6 refs Transl. into ENGLISH from Kosm. Biol. Med. (Moscow), v. 7, no. 5, Sep. - Oct. 1973 p 3-7 (For availability see N74-10953 02-04)

The general dynamic and energy properties of open systems and their evolution during the course of formation of living systems are reviewed. From this point of view it discusses the criteria for existence and methods for detecting life on other planets which were described in the literature. Author

**N74-10955** Joint Publications Research Service, Arlington, Va.
**BIOLOGICAL SIMILARITY AND SCALING OF A MODEL OF OXYGEN SUPPLY TO THE CEREBRAL TISSUES OF ANIMALS**
V. Sh. Berikashvili, Ye. A. Kovalenko, and A. V. Ryazhskiy *In its* Space Biol. and Med., Vol. 7, No. 5, 1973 (JPRS-60471) 7 Nov. 1973 p 7-16 refs Transl. into ENGLISH from Kosm. Biol. Med. (Moscow), v. 7, no. 5, Sep. - Oct. 1973 p 7-13

The use of similarity properties of the main physiological systems of mammals for arriving at numerical laws and their transfer from one group of animals to another is discussed. Equations are derived for assessing the physiological parameters of biologically similar animals. The procedure of calculating models in the form of linear differential equations of a random degree is developed. Possibilities of this procedure are illustrated by calculating a model which shows changes in oxygen pressure in the brain tissues of dogs in relation to variations of oxygen content in the environment. The model is calculated with respect to rats. The modeling results are in good agreement with the experimental findings. This suggests the possibility of generalizing the experimental results and calculating a model for man.
Author

**N74-10956** Joint Publications Research Service, Arlington, Va.
**ANALYSIS OF RESULTS OF INVESTIGATION OF BIOLOGICAL EFFECT OF HEAVY IONS WITH DIFFERENT LINEAR ENERGY LOSSES ON THE BASIS OF A THEORETICAL INACTIVATION MODEL (THEORETICAL INACTIVATION MODEL)**
K. Guenther, Ye. A. Krasavin, Ye. I. Kudryashov, N. I. Ryzhov, and W. Schulz *In its* Space Biol. and Med., Vol. 7, No. 5, 1973 (JPRS-60471) 7 Nov. 1973 p 17-24 refs Transl. into ENGLISH from Kosm. Biol. Med. (Moscow), v. 7, no. 5, Sep. - Oct. 1973 p 14-20

It is assumed that cell inactivation is brought about by damage of nuclear DNA which in turn is induced by ionizations occurring in a volume of a known radius containing DNA. On this basis a theoretical model of cell inactivation for ionizing radiations with different linear energy losses was formulated. Using this model, the relationship between the number of single strand and double strand DNA breakages and radiations with linear energy losses differing by a factor of 10,000 is analyzed. Theoretical and experimental results show good agreement. Author

**N74-10957** Joint Publications Research Service, Arlington, Va.
**PHYSIOLOGICAL REACTIONS IN WHITE RATS DURING READAPTATION AFTER ADAPTION TO HYPOXIC HYPOXIA**
V. I. Korolkov, M. S. Gayevskaya, L. V. Serova, Ye. A. Nosova, I. Ya. Lunev, I. I. Britvan, and M. A. Dotsenko *In its* Sapce Biol. and Med., Vol. 7, No. 5, 1973 (JPRS-60471) 7 Nov. 1973 p 25-30 refs Transl. into ENGLISH from Kosm. Biol. Med. (Moscow), v. 7, no. 5, Sep. - Oct. 1973 p 20-23

Results of studies of the physiological reactions of white rats during readaptation following their adaptation to hypoxic hypoxia are presented. The experiments were carried out on 120 common male rats weighing 170 to 190 g, the duration of the exposure to hypoxia being 30 days and that of the readaptation period being 30 days. The collected data show that the positive responses of the animal body which developed during stage-by-stage adaptation to hypoxia, such as activation of the erythrocytic system and increased tolerance to acute hypoxia, are transient and disappear a few days after hypoxic training. Author

**N74-10958** Joint Publications Research Service, Arlington, Va.
**STATE OF NATURAL IMMUNITY OF DOGS EXPOSED TO CHRONIC GAMMA IRRADIATION**
V. M. Shilov, S. I. Palmina, and B. A. Markelov *In its* Space Biol. and Med., Vol. 7, No. 5, 1973 (JPRS-60471) 7 Nov. 1973 p 31-38 refs Transl. into ENGLISH from Kosm. Biol. Med. (Moscow), v. 7, no. 5, Sep. - Oct. 1973 p 23-28

The results of a study of the natural immunity of dogs which were exposed to three-year chronic gamma irradiation are presented. The relationship between changes in the humoral and cellular factors of natural immunity and the irradiation dose was established. The animals which were irradiated in a dose of 21 rad per year exhibited activation of the complementary and bactericidal properties of the blood. The dogs which were irradiated in doses of 125 rad and 62 + 125 rad per year exhibited changes in immunological reactivity which adhered to certain phases: stimulation was accompanied by a marked decline. These findings give evidence of large compensatory capabilities of the animal body during chronic exposure to ionizing radiation. Author

**N74-10959** Joint Publications Research Service, Arlington, Va.
**STATE OF SKELETAL BONES IN RATLETS BORN FROM FEMALES EXPOSED TO ROLONGED HYPODYNAMIA**
Ye. A. Stroganova and A. I. Volozhin *In its* Space Biol. and Med., Vol. 7, No. 5, 1973 (JPRS-60471) 7 Nov. 1973 p 39-44 refs Transl. into ENGLISH from Kosm. Biol. Med. (Moscow), v. 7, no. 5, Sep. - Oct. 1973 p 28-32

Nine male and nine female rats were exposed to 60-day hypokinesia. Eight male and eight female rats which served as controls were kept in normal cages. After the exposure to hypodynamia the test animals were mated simultaneously with the controls. In comparison with the controls the test rats delivered their young later and in a smaller number. These young rats opened their eyes and became hair-covered at a later time. During the first 30 to 40 days their weight and size lagged behind the parameters of the controls. At later stages the difference in these parameters disappeared. During the development test young rats exhibited a higher degree of mineralization and Ca-45 incorporation in bone and tooth tissues. This seems to be a manifestation of compensatory mechanisms aimed at restoration of metabolic processes in calcified tissues during the postembryonal period. Author

**N74-10960** Joint Publications Research Service, Arlington, Va.
**BLOOD AND TISSUE LIPIDS IN HYPODYNAMIC RATS**
T. M. Lobova *In its* Space Biol. and Med., Vol. 7, No. 5, 1973 (JPRS-60471) 7 Nov. 1973 p 45-50 refs Transl. into ENGLISH from Kosm. Biol. Med. (Moscow), v. 7, no. 5, Sep. - Oct. 1973 p 32-35

The effect of hypodynamic exposures of different duration on the level of cholesterol, beta-lipoproteins and total lipids in

the serum, skeletal muscles, heart, liver, and brain of rats was studied. These investigations revealed that a hypodynamic exposure was followed by an increase in the level of cholesterol and beta-lipoproteins in the serum. The cholesterol content in tissues, especially in the skeletal muscles, increased. The total quantity of lipids in the skeletal muscles, liver, and to a lesser extent, in the heart, decreased. Author

**N74-10961** Joint Publications Research Service, Arlington, Va.
**FREE AMINO ACIDS IN ANIMAL TISSUES DURING HYPODYNAMIA**
I. V. Fedorov *In its* Space Biol. and Med., Vol. 7, No. 5, 1973 (JPRS-60471) 7 Nov. 1973 p 51-56 refs Transl. into ENGLISH from Kosm. Biol. Med. (Moscow), v. 7, no. 5, Sep. - Oct. 1973 p 35-39

Experiments on rats revealed that the content of amino acids in tissues changes by the second to third week of hypokinesia: the content of some amino acids increases and that of others decreases. During the eighth to ninth weeks of hypokinesia the content of amino acids and the level of individual amino acids decrease noticeably. Possible effects of these changes on the synthesis of tissue proteins are discussed. Author

**N74-10962** Joint Publications Research Service, Arlington, Va.
**MOTOR-EVACUATION FUNCTION OF THE GASTROINTESTINAL TRACT IN DOGS DURING PROLONGED HYPODYNAMIA**
I. G. Krasnykh and L. A. Tyutin *In its* Space Biol. and Med., Vol. 7, No. 5, 1973 (JPRS-60471) 7 Nov. 1973 p 57-64 refs Transl. into ENGLISH from Kosm. Biol. Med. (Moscow), v. 7, no. 5, Sep. - Oct. 1973 p 40-45

The hypodynamic effect of the motor evacuation function in the gastrointestinal tract was studied in dogs. In the first experimental series ten dogs were exposed to 15-day hypokinesia, in the second experimental series 10 dogs were exposed to 30-day hypokinesia; in the third experimental series nine dogs were exposed to 60-day hypokinesia. The hypodynamic effect was brought about by confining the animals in cages of variable volume. The motor-evacuation function in the gastrointestinal tract was investigated by serial radiography. Exposure to 15-day hypokinesia delayed bowel evacuation of these dogs by an average of 1.4 hours (in this case and in all other cases the difference is statistically significant); six of the dogs exhibited pyloric spasms. On the average the bowel evacuation of these dogs ended 30 hours later than prior to exposure to hypodynamia. With an increase in exposure the gastrointestinal changes progressed. Author

**N74-10963** Joint Publications Research Service, Arlington, Va.
**INFLUENCE OF ACCELERATIONS ON ACTIVITY OF THE PROTEIN-SYNTHESIZING SYSTEM AND RNA SYNTHESIS IN THE LIVER OF RATS**
O. Yu. Abakumova, N. G. Kutsenko, I. D. Yertanov, Ye. M. Semina, and M. I. Lerman *In its* Space Biol. and Med., Vol. 7, No. 5, 1973 (JPRS-60471) 7 Nov. 1973 p 65-74 refs Transl. into ENGLISH from Kosm. Biol. Med. (Moscow), v. 7, no. 5, Sep. - Oct. 1973 p 45-51

Experiments were carried out to study the effect of back-to-chest accelerations of 25 and 36 g applied for six minutes on the activity of the protein-synthesizing system and RNA synthesis in the liver of Wistar rats. This exposure accelerated the incorporation of C-14-amino acids into both polypeptides growing on ribosomes and completed cytoplasmatic proteins. Actinomycin D did not reverse the effect of an increase in the absolute rate of protein synthesis. An exposure to 36-g acceleration increased the absolute rate of albumin synthesis in the liver cells, but did not change the time of its secretion into the blood. Following these exposures, the synthesis of different classes of nuclear and cytoplasmatic RNA in the liver cells increased noticeably. The exposure had no effect on the specific reactivity of the pool of tagged precursors of RNA and protein. Author

**N74-10964** Joint Publications Research Service, Arlington, Va.
**DEPENDENCE OF REFLEX CIRCULATORY REACTIONS DURING STIMULATION OF THE SINOCAROTID ZONES ON STIMULUS INTENSITY AND TYPE OF ANESTHETIC (EXPERIMENTAL STUDY ON ANIMALS)**
B. M. Fedorov and V. A. Kondratyeva *In its* Space Biol. and Med., Vol. 7, No. 5, 1973 (JPRS-60471) 7 Nov. 1973 p 75-81 refs Transl. into ENGLISH from Kosm. Biol. Med. (Moscow), v. 7, no. 5, Sep. - Oct. 1973 p 51-55

In acute and chronic experiments on dogs, the stimulation effect, type and depth of anesthesia on cardiovascular reflexes in response to sinocarotid stimulation, as well as the relationship between cardiac and vascular components during pressor reflex in response to carotid artery occlusions were investigated. An increase in arterial pressure during the pressor reflex was dependent primarily on the vascular component. With a low level of dilatation of the carotid arteries, the depressor effect may be completely overlapped by the pressor effect induced by the artery occlusion. Author

**N74-10965** Joint Publications Research Service, Arlington, Va.
**INDUCED ACTIVITY OF RESPIRATORY CENTER NEURONS ACCOMPANYING STIMULATION OF THE UTRICULAR NERVE AND SPINAL CORD ROOTS**
G. S. Ayzikov and L. A. Radkevich *In its* Space Biol. and Med., Vol. 7, No. 5, 1973 (JPRS-60471) 7 Nov. 1973 p 82-89 refs Transl. into ENGLISH from Kosm. Biol. Med. (Moscow), v. 7, no. 5, Sep. - Oct. 1973 p 55-60

It is demonstrated that vestibular and muscular afferents for individual respiratory neurons of the medulla oblongata converge. With respect to the latent periods of induced responses, it was established that the relationships between the respiratory center and vestibular and somatic afferents are mostly polysynaptic. The pattern of responses of respiratory neurons was dependent on their functional state. The response of respiratory neurons to somatosensory stimulation was more pronounced than in the case of vestibular stimulation. Author

**N74-10966** Joint Publications Research Service, Arlington, Va.
**DYNAMICS AND REGULATION OF VENOUS RETURN, MINUTE VOLUME AND STROKE VOLUME WITH A CHANGE IN BODY POSITION**
L. I. Kakurin, V. I. Shumakov, V. Ye. Katkov, and A. Ye. Kuvayev *In its* Space Biol. and Med., Vol. 7, No. 5, 1973 (JPRS-60471) 7 Nov. 1973 p 90-97 refs Transl. into ENGLISH from Kosm. Biol. Med. (Moscow), v. 7, no. 5, Sep. - Oct. 1973 p 60-65

Hemodynamic changes due to negative and positive gravity loads simulated by positioning of the body at 30 and 80 deg with the head upwards and downwards for five minutes were studied in dogs. A decrease in the hydrostatic pressure in the intrathoracic vessels was found to change circulation and complicate the relationship between venous return, pressure of ventricular filling and stroke volume. Possible mechanisms of regulation of circulation with the head downwards and the head upwards are discussed. Changes in the venous return and stroke volume due to a passive change in body position of man and dogs seem to be parallel. Author

**N74-10967** Joint Publications Research Service, Arlington, Va.
**INFLUENCE OF ANABOLIC STEROIDS ON THE TRANSFER CHARACTERISTICS OF A MAN-OPERATOR UNDER THE INFLUENCE OF INDIVIDUAL SPACEFLIGHT FACTORS**
A. K. Sgibnev, V. K. Filosofov, and N. V. Pisarenko *In its* Space Biol. and Med., Vol. 7, No. 5, 1973 (JPRS-60471) 7 Nov. 1973 p 98-102 refs Transl. into ENGLISH from Kosm. Biol. Med. (Moscow), v. 7, no. 5, Sep. - Oct. 1973 p 65-68

The anabolic steroid hormone oranobol taken in a dose of 20 mg per day for a period of seven days does not worsen the level of control work and does not influence the state of health and metabolism of a man operator. When studying drug effects

on the work quality of a man opertor, a complex signal is used to which adaptation is virtually impossible. Author

**N74-10968** Joint Publications Research Service, Arlington, Va.
**INFLUENCE OF INCREASED PARTIAL PRESSURE OF OXYGEN ON THE ACID-ALKALI STATE OF THE BLOOD**
V. A. Glazkova and I. N. Chernyakov *In its* Space Biol. and Med., Vol. 7, No. 5, 1973 (JPRS-60471) 7 Nov. 1973 p 103-110 refs Transl. into ENGLISH from Kosm. Biol. Med. (Moscow), v. 7, no. 5, Sep. - Oct. 1973 p 68-73

Acid-alkali equilibrium was studied in animals and humans by the Astrup-Siegaard-Andersen method. Changes in acid-alkali equilibrium were shown to be dependent on the PO2 in the breathed air and the duration of hyperoxia. The correlation between the acid-alkali equilibrium and morphological changes in the pulmonary tissue induced by hyperoxia suggests that morphological changes may occur and develop in the absence of apparent X-ray shifts. Author

**N74-10969** Joint Publications Research Service, Arlington, Va.
**ELIMINATION OF TRACE ELEMENTS DURING PROLONGED FEEDING OF MAN WITH DEHYDRATED FOODS**
Ye. I. Pokrovskaya, A. P. Tereshchenko, and V. N. Zhurenko *In its* Space Biol. and Med., Vol. 7, No. 5, 1973 (JPRS-60471) 7 Nov. 1973 p 111-117 refs Transl. into ENGLISH from Kosm. Biol. Med. (Moscow), v. 7, no. 5, Sep. - Oct. 1973 p 73-77

The content of iron, copper, manganese, zinc, molybdenum, vanadium, cobalt, nickel, lead, tin, chromium and aluminum was measured in five dehydrated diets each providing 3,000 Cal per day. The excretion of these elements was evaluated for the test subjects who were on the diet for a year in a sealed chamber. The excretion of almost all the trace elements revealed a great variability. It was particularly high for urine excretion (20-70%). Variations in the urine excretion of iron, molybdenum, aluminum, lead and chromium were found to reflect changes in their food content. No relationship of this type was established for copper, manganese, vanadium, nickel or tin. Author

**N74-10970** Joint Publications Research Service, Arlington, Va.
**EXPERIMENTAL STUDY OF THE DIURNAL RHYTHM OF PHYSIOLOGICAL FUNCTIONS, PERFORMANCE AND SLEEP IN MAN MODIFIED REGIMES WITH DOUBLE ALTERNATION OF SLEEP AND WAKEFULNESS**
A. N. Litsov *In its* Space Biol. and Med., Vol 7, No. 5, 1973 (JPRS-60471) 7 Nov. 1973 p 119-128 refs Transl. into ENGLISH from Kosm. Biol. Med. (Moscow), v. 7, no. 5, Sep. - Oct. 1973 p 78-85

The dynamics of diurnal rhythm of physiological functions, work performance and sleep of test subjects exposed to two schedules with a double alternation of work and rest exhibited the same three stages (latent, apparent and deep) which were observed under other schedules. The adaptation of test subjects to this alternation of sleep and wakefulness may adhere to a fractioned (4 + 4 hours and 6 + 2 hours), displaced (4 + 0.6 + 0 hours) or mixed (fractioned, disturbed and refractioned) schedules. The best schedule was a cycle with 6 + 2 hours of sleep. A schedule with two equal sleep cycles can be used temporarily to solve operational or emergency problems as well as an intermediate one. Author

**N74-10971** Joint Publications Research Service, Arlington, Va.
**INVESTIGATION OF THE POSSIBILITY OF INCREASING THE NOISE IMMUNITY OF UNIPOLAR CHEST LEADS**
R. A. Vartbaronov, L. N. Nikolskiy, and V. I. Polyakov *In its* Space Biol. and Med., Vol. 7, No. 5, 1973 (JPRS-60471) 7 Nov. 1973 p 129-135 refs Transl. into ENGLISH from Kosm. Biol. Med. (Moscow), v. 7, no. 5, Sep. - Oct. 1973 p 85-90

Bioelectric activity measurements of the heart in sport and aerospace medicine and also work physiology are made difficult due to the appearance of different kinds of interference caused by the motor activity of man and other factors. The possibility of increasing noise immunity by placing the neutral electrode in the chest region is reported. Author

**N74-10972** Joint Publications Research Service, Arlington, Va.
**WORK OF THE AEROSPACE MEDICINE SECTION OF THE MOSCOW PHYSIOLOGICAL SOCIETY IN 1972**
Ye. M. Yuganov and V. V. Usachev *In its* Space Biol. and Med., Vol. 7, No. 5, 1973 (JPRS-60471) 7 Nov. 1973 p 136-138 Transl. into ENGLISH from Kosm. Biol. Med. (Moscow), v. 7, no. 5, Sep. - Oct. 1973 p 90-91

Aerospace medical problems discussed at several conferences covered the principle areas of acceleration and weightlessness, manned space flight hygiene, high altitude physiology, flight psychophysiology, radiobiology, and screening and training of space flight crews. G.G.

**N74-10973#** Interuniversitair Reactor Instituut, Delft (Netherlands).
**HYDROXYPROLINE IN BLOOD AND URINE: INDICATION OF COLLAGEN METABOLISM. - THE DETERMINATION OF D- AND L-C-14 AMINO ACIDS IN THE PRESENCE OF THEIR METABOLITES**
C. J. A. VanDenHamer and W. Hart (Utrecht Univ. Hosp.) 1972 16 p refs Submitted for publication
(IRI-133-72-18) Avail: NTIS HC $3.00

The study of hydroxyproline degradation in patients with renal insufficiency was expected to produce parameters for the kidney function. C-14 was measured in blood plasma and urine samples of patients previously injected with a DL-2-C-14-hydroxyproline dose. Since some of the C-14 could be due to metabolites and the ratio D/L hydroxyproline could vary due to different enzymes in the body, a method for determining the hydroxyproline distribution was developed, making use of thin layer chromatography and liquid scintillation counting. The C-14 percentage found for samples previously treated with D-amino acid oxidose (E.C.1.4.3.3) represents the percentage of the L-form only. The results for patients suffering from renal insufficiency, to be published elsewhere, show variable percentages of the D- and L-isomers of hydroxyproline and of C-14 containing metabolites. ESRO

**N74-10974#** Heinrich-Hertz-Institute fuer Schwingungsforschung, Berlin (West Germany).
**ELECTROPHYSIOLOGICAL INVESTIGATIONS ON PITCH ANALYSIS [ELECTROPHYSIOLOGISCHE UNTERSUCHUNGEN ZUR TONHOEHENANALYSE MIT WIEDERHOLUNGSRAUSCHEN ALS SIGNAL]**
Georg Boerger and Juergen Gruber 13 Apr. 1972 32 p refs In GERMAN
(Contracts DFG-CR-5/36; DFG-CR-5/44)
(TB-151) Avail: NTIS HC $3.75

Electrophysiological investigations of the acoustic nerve in cats are reported. By formation of the autocorrelation function of action potential (AP) series, its time structure was analyzed. In the case of repetition noise, such as a signal, it was demonstrated that the time parameters in the AP series, functioning as carrier of the pitch information, are present in the single fibers of the acoustic nerve but are not so pronounced as those relating to the resonant frequency of the fibers. The simultaneous leakage of Ap's from several fibers was recorded on magnetic tape. By combination of these AP series in a synopsis model it was possible to isolate the effective time parameters. ESRO

**N74-10975*** Lockheed Missiles and Space Co., Sunnyvale, Calif.
**WHOLE BODY MEASUREMENT SYSTEMS Patent**
John S. Ogle, inventor (to NASA) Issued 6 Nov. 1973 5 p Filed 18 Nov. 1971 Supersedes N72-20105 (10 - 11, p 1433) Sponsored by NASA
(NASA-Case-MSC-13972-1; US-Patent-3,769,834;
US-Patent-Appl-SN-200040; US-Patent-Class-73-149;
US-Patent-Class-128-2S) Avail: US Patent Office CSCL 06B

A system for measuring the volume and volume variations of a human body under zero gravity conditions is disclosed. An enclosed chamber having a defined volume and arranged for receiving a human body is provided with means for infrasonically varying the volume of the chamber. The changes in volume

produce resultant changes in pressure, and under substantially isentropic conditions, an isentropic relationship permits a determination of gas volume which, in turn, when related to total chamber volume permits a determination of the body volume. By comparison techniques, volume changes of a human independent of gravity conditions can be determined.
Official Gazette of the U.S. Patent Office

**N74-10976#** Joint Publications Research Service, Arlington, Va.
**STRUCTURAL CHANGES IN SPEECH UTTERED IN A HELIUM-OXYGEN MEDIUM**
L. S. Butyrskiy and B. I. Petlenko 27 Nov. 1973 14 p refs Transl. into ENGLISH from Akust. Zh. (Moscow), v. 19, no. 5, 1973 p 653-661
(JPRS-60633) Avail: NTIS HC $3.00

An evaluation of disturbances is presented for the basic parameters of speech uttered in a helium-oxygen atmosphere at various pressures of the medium. Author

**N74-10977#** Joint Publications Research Service, Arlington, Va.
**AEROSPACE HUMAN FACTORS ENGINEERING**
V. G. Denisov and V. F. Onishchenko 31 Oct. 1973 279 p refs Transl. into ENGLISH of the book "Inzhenernaya Psikhologiya v Aviatsii i Kosmonavtike" Moscow, Mashinostr., 1972 316 p
(JPRS-60419) Avail: NTIS HC $16.00

An examination of the problems of the interaction of the operator and machine under different working conditions during a flight on an aircraft or spacecraft is reported. From the standpoint of human factors engineering, the report generalizes and analyzes experimental materials on the control of spacecraft and aircraft. It shows the change in the psychophysiological capabilities of an operator as a result of adapting man to the machine and the machine to man. It also defines the basic theoretical problems in the area of developing and employing man-machine systems on aircraft and spacecraft as well as the ways for solving these problems. Author

**N74-10978*#** United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.
**EFFECTS OF HELICOPTER NOISE AND VIBRATION ON PILOT PERFORMANCE (AS MEASURED IN A FIXED-BASE FLIGHT SIMULATOR)**
Allan M. Stave 7 Dec. 1973 89 p refs
(Contract NAS1-11222)
(NASA-CR-132347) Avail: NTIS HC $6.50 CSCL 05E

The effects of noise and vibration on pilot performance are described. Pilot subjects were required to fly VTOL commercial IFR schedules using the computer simulation facilities. The routes flown simulated closely metropolitan routes flown currently by a helicopter airline. The duration of simulator flights ranged from 3 to 8 hours. Subjects were exposed to noise sound pressure levels ranging from 74dB (ambient) to 100dB and 17 Hz vibration stimuli ranging from .1 g to .3 g measured at the floor directly beneath the pilot's seat. Despite subject reports of extreme fatigue in these long flights, performance did not degrade. A curve of performance shows a slow improvement for the first three hours of exposure and a slight loss in performance during the remainder of the flight. As environmental stress conditions (noise, vibration, and time in the simulator) increased, subject performance improved. Within the limits of this study, the higher the stress the better the performance. Author

**N74-10979*#** National Aeronautics and Space Administration, Washington, D.C.
**A BIOLOGIST'S QUESTIONS ON SPACE**
A. Burnazyan Nov. 1973 4 p Transl. into ENGLISH from Pravda (Moscow), 9 Nov. 1973 p 3
(NASA-TT-F-15210) Avail: NTIS HC $3.00 CSCL 06B

Biological experiments in space are outlined that consider the effects of weightlessness, penetrating radiation, and their joint results on a variety of biological subjects in order to formulate medicobiological safeguards for long duration manned space flights. A fully automated experiment with animals and biological specimens is being conducted on Cosmos 605 to obtain statistically reliable data about the influence of space flight factors on the structure and functions of the organism. G.G.

**N74-10980#** Society of Automotive Engineers, Inc., New York.
**AN EVALUATION OF PSYCHOACOUSTIC PROCEDURES FOR DETERMINING HUMAN RESPONSE TO AIRCRAFT NOISE. VOLUME 1: SPECIFICATIONS FOR FOUR EXPERIMENTS Final Report**
Oct. 1973 65 p
(Contract DOT-FA71WA-2673)
(SAE/R-12-Vol-1; FAA-RD-72-51-Vol-1) Avail: NTIS HC $5.25

Absence of high agreement among laboratory studies involving human response to aircraft noise led to the conclusion that the application of different psychoacoustic procedures could account for differing conclusions. Since there is a continuing requirement to develop an engineering calculation procedure which validly reflects response to flyover noise from future aircraft, a three phase program was conceptualized. That considers detailing of specifications and requirements for four psychoacoustic laboratory experiments plus the acquisition of tape recordings of noises that match the four experiments. The four psychoacoustic laboratory experiments are: Constant Stimulus Difference (Pair Comparison)(CSD); Magnitude Estimation (ME); Numerical Category Scaling (NCS); and Method of Adjustment (MOA).
Author

**N74-10981#** MAN-Acoustics and Noise, Inc., Seattle, Wash.
**AN EVALUATION OF PSYCHOACOUSTIC PROCEDURES FOR DETERMINING HUMAN RESPONSE TO AIRCRAFT NOISE. VOLUME 2: DEMONSTRATED EXAMPLES Final Report**
J. E. Mabry and H. J. Parry Oct. 1973 82 p Prepared for SAE
(Contract DOT-FA71WA-2673)
(SAE/R-12-2-Vol-2; FAA-RD-72-51-Vol-2) Avail: NTIS HC $6.25

A variety of laboratory procedures have been used to measure human response to aircraft noise during the development of the effective perceived noise level concept. Evaluation of these procedures to determine their effectiveness would be useful in further refinements of EPNL. A project is reported that demonstrates how four of the laboratory methods can be tested and the results used to provide a comparative evaluation. The general conclusion is that experimental plans for four basic psychoacoustic laboratory methods have been demonstrated. Author

**N74-10982#** Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).
**INVESTIGATION OF BINARY SELECTABLE CONTROL SIGNAL GAIN FOR A TARGET DESIGNATION TASK [UNTERSUCHUNG DER BINAER WAEHLBAREN BEDIEN-SIGNALVERSTAERKUNG BEI EINER POSITIONIERUNG-SAUFGABE]**
Guenther Rothbauer, Walter Krueger, and Wolfgang Kruse Oct. 1972 53 p refs In GERMAN; ENGLISH summary
(FB-8) Avail: NTIS HC $4.75; Forschungsinst. fuer Anthropotech., Meckenheim, West Ger. 10 DM

A fingerstick with selectability of two different levels of control gain was built to provide the operator simultaneously with the advantages of both high and low control gain in a target designation task. The problems of variable control gain are discussed briefly, and an investigation is reported in which a comparison was made between target designation performance with and without binary selectable control gain in a 0-order system. Two dots or two larger rectangles served as display signals. The performance of 12 subjects indicated that binary selectable control gain improved accuracy and reliability of target designation without markedly affecting the self estimated workload. The dots as display signals were superior to the rectangles with respect to designation error. The selectable control gain is recommended for determining the limit between coarse and fine adjustment in a target designation task. Author (ESRO)

**N74-10983#** Army Concept Team in Vietnam, San Francisco, Calif. 96384.
**ARMY AIRCREW CLOTHING, EQUIPMENT, AND SURVIVAL GEAR**
1973 23 p
(AD-766664) Avail: NTIS CSCL 15/5

A proposal was made that all Army aviators be given an initial issue of flight items authorized by TA-21 (Peace), i.e., APH-5 helmet, sun glasses, E-6B computer, etc., upon the successful completion of flight training and rating as an Army aviator by Department of the Army orders. This transaction should be entered on a suitable DA form and made a part of the individual's permanent flight record. The record would show that the equipment has been issued and that the individual is directly responsible and accountable for the property. The equipment would accompany the individual on all transfers. In terms of supply economy there could be substantial savings by adopting this system since, at present, expense is incurred by duplicate or recurring issues. Enlisted aircrew members should continue to draw TA-21 flying equipment through unit supply channels. A resume of the current status, problem areas, and recommendations for items of aircrew clothing, equipment, and survival gear is given. GRA

**N74-10984#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
**EDUCATIONAL METHODS TEXTBOOKS**
G. L. Petrov 31 Jul. 1973 164 p refs Transl. into ENGLISH from Tr. Politekhn. Inst. (Leningrad), 1966 p 1104
(AD-765580; FTD-MT-24-346-73) Avail: NTIS CSCL 05/9

The training of engineers in welding is achieved in the Soviet Union by following two lines: Equipment and technology, and metallurgy and technology. The Leningrad Polytechnical Institute prepares engineers having a broad background for special training programs. GRA

**N74-10985#** Boeing Aerospace Co., Seattle, Wash.
**ABRASIVE BLASTING RESPIRATORY PROTECTIVE PRACTICES SURVEY Final Report, 29 Jun. 1971 - 31 Aug. 1973**
Austin Blair 31 Aug. 1973 126 p refs
(Contract HSM-099-71-47)
(PB-223073/8; NIOSH-TR-048-73; D195-10012-1) Avail: NTIS HC $8.50 CSCL 06I

The abrasive blasting respiratory protective practices survey was conducted using a refined population technique. The results indicate there are approximately one hundred thousand abrasive blasters with personnel exposures to silica dust environments up to sixty million manhours per year. The protection afforded these workmen is, on the average, marginal to poor. Equipment deficiencies and lack of maintenance are the rule rather than the exception. The average sandblaster appeared to have an excellent chance of receiving above TLV quartz exposures and extreme noise exposures. GRA

**N74-11398** Hydrometeorological Service of the USSR.
**INTERACTION OF MAN AND HIS ENVIRONMENT. PRESENT SITUATION AND PROSPECTS FOR THE FUTURE**
Evgeniy Konstantinovich Fedorov *In* WMO Selected Papers on Meteorol. as Related to the Human Environ. 1971 p 115-125

The interaction of human society with the environment is traced and discussed. Reference is made to mineral deposits and exploitation, utilization of natural resources, water and air pollution, and variations in climate. The conditions under which man can survive in his environment are presented. ESRO

**N74-11690*** Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
**TRANSDUCER TECHNOLOGY TRANSFER TO BIO-ENGINEERING APPLICATIONS**
E. N. Duran, G. W. Lewis, C. Feldstein, E. Corday (Cedars-Sinai Med. Center), S. Meerbaum (Cedars-Sinai Med. Center), and Tzu-Wang Lang (Cedars-Sinai Med. Center) *In* NASA. Langley Res. Center The 8th Aerospace Mech. Symp. Oct. 1973 p 283-292 refs
(Contracts NAS7-100; HE-14943-01; HL-14644-02)
CSCL 06B

The design and development of various mechanisms for space and aeronautical research programs are reported. Emphasis is placed on aerospace mechanisms that have been either flight qualified or flight demonstrated.

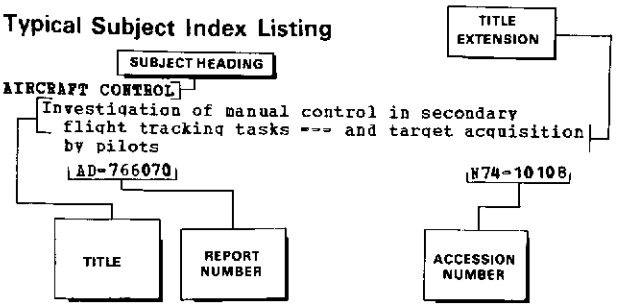
**N74-11692*** Gyrotrim Corp., Santa Clara, Calif.
**A GRAVITY EXERCISE SYSTEM**
William E. Brandt and Allen L. Clark *In* NASA. Langley Res. Center The 8th Aerospace Mech. Symp. Oct. 1973 p 311-316 ref
CSCL 06B

An effective method for muscle conditioning during weightlessness flight is derived from isometric exercise. The basic principle of gravity exercise is to periodically displace the human body upon reactionless rollers so that spacial equilibrium can only be maintained by the proper tension and relaxation of the body's muscles. A rotating platform mounted upon two degrees of freedom rollers provides such a condition of gravitational reaction stress throughout each of its 360 deg rotation. G.G.

# Subject Index

**AEROSPACE MEDICINE AND BIOLOGY** / *A Continuing Bibliography (Suppl. 125)* **FEBRUARY 1974**

## Typical Subject Index Listing

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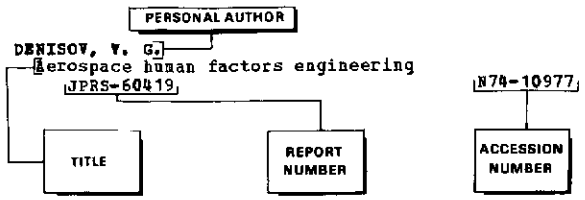
## Typical Personal Author Index Listing

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